Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (04-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Jeffrey R. Ambroziak	Nonprovisional Application Number (if known):	
Title of Invention:	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Carson C.K. Fincham, Reg.#54096/	Date June 23, 2023
Name (Print/Typed) Carson C.K. Fincham	Practitioner Registration Number 54096

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☑ *Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/340,781	**06/23/2023 07:47:32 PM ET**	**CF01-001-02-07**

Title of Invention

SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8229	FILED BY	Carson Fincham
PATENT CENTER #	62329717	AUTHORIZED BY	-
CUSTOMER #	89411	FILING DATE	-
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Mr. Jeffrey R. Ambroziak

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 6195	**E20236MJ 48468901**	**Carson Fincham**

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
505363	**37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post Issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges)**

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2830	PROCESSING FEE, EXCEPT IN PROVISIONAL APPLICATIONS	56.00	1	56.00
2817	REQUEST FOR PRIORITIZED EXAMINATION	1680.00	1	1680.00
2111	UTILITY PATENT APPL. SEARCH FEE	280.00	1	280.00
4011	BASIC FILING FEE- UTILITY	64.00	1	64.00

2311	EXAMINATION OF ORIGINAL PATENT APPLICATION	320.00	1	320.00

TOTAL AMOUNT: **$2,400.00**

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

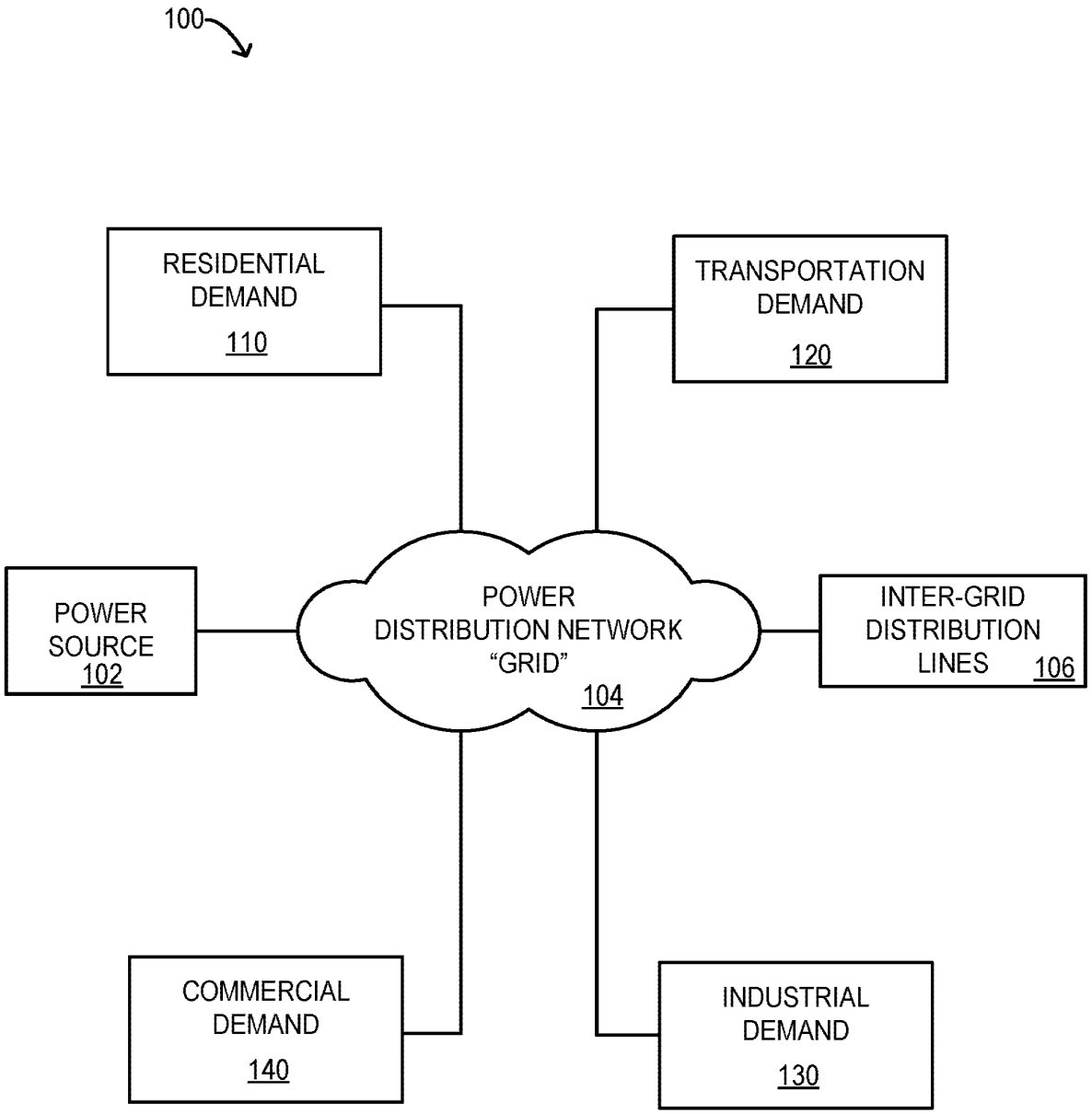
If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.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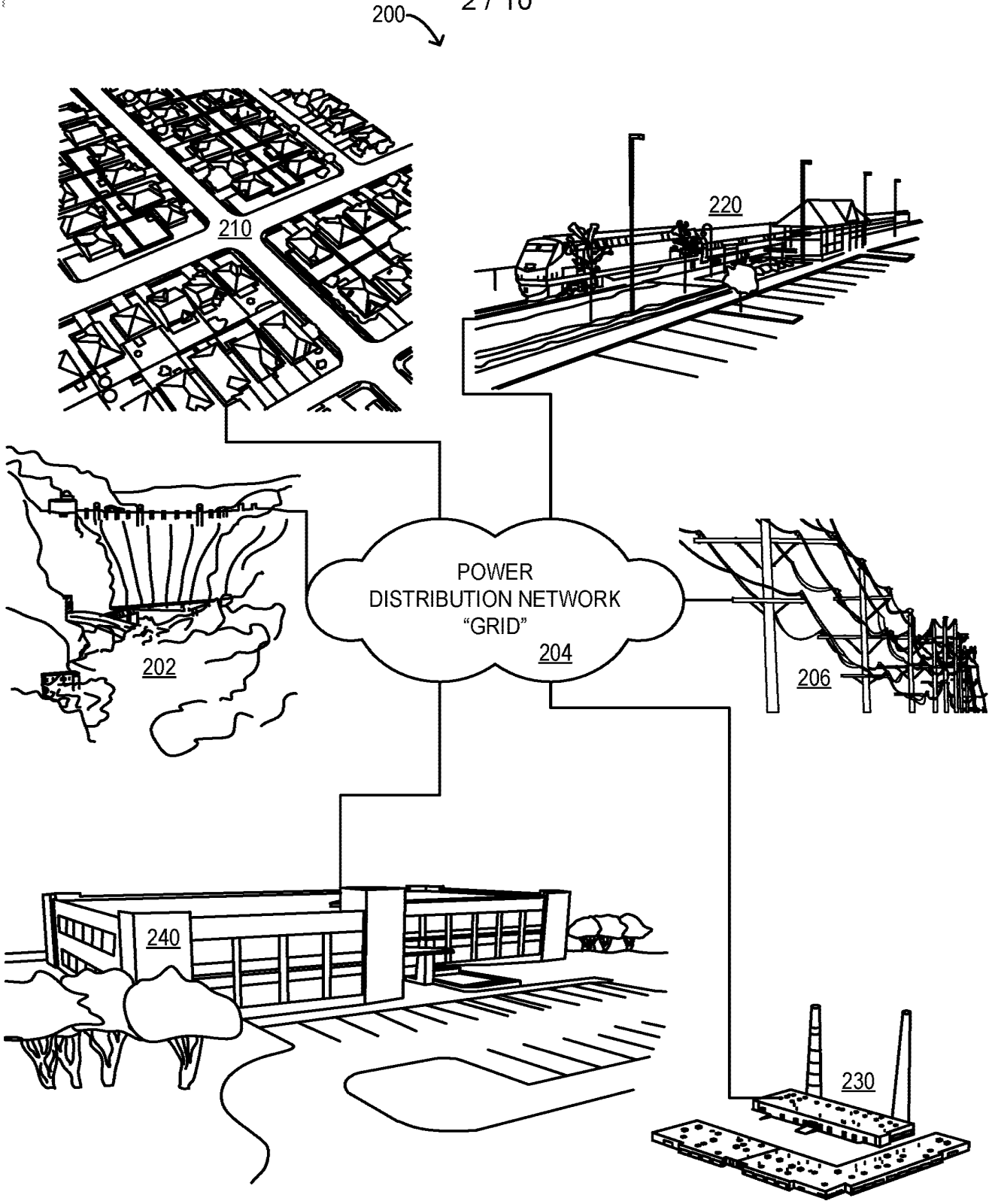
110
TRANSPORTATION DEMAND
120
POWER SOURCE
102
POWER DISTRIBUTION NETWORK "GRID"
104
INTER-GRID DISTRIBUTION LINES
106
COMMERCIAL DEMAND
140
INDUSTRIAL DEMAND
130

FIG. 1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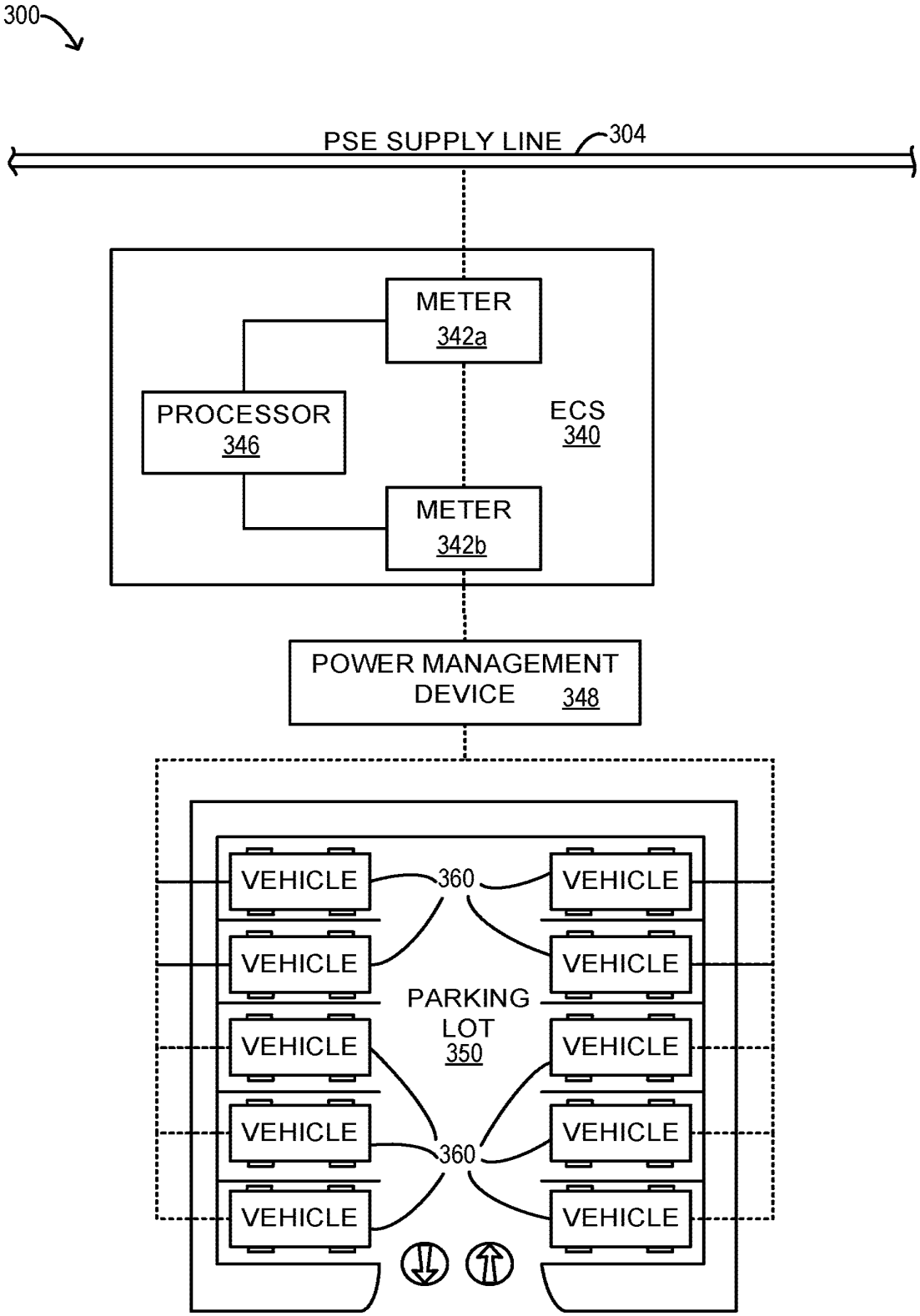
210
220
202
POWER
DISTRIBUTION NETWORK
"GRID"
204
206
240
230

FIG. 2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304
METER
342a
PROCESSOR
346
ECS
340
METER
342b
POWER MANAGEMENT DEVICE
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360
VEHICLE
VEHICLE
VEHICLE
PARKING LOT
350
VEHICLE
VEHICLE
VEHICLE
360
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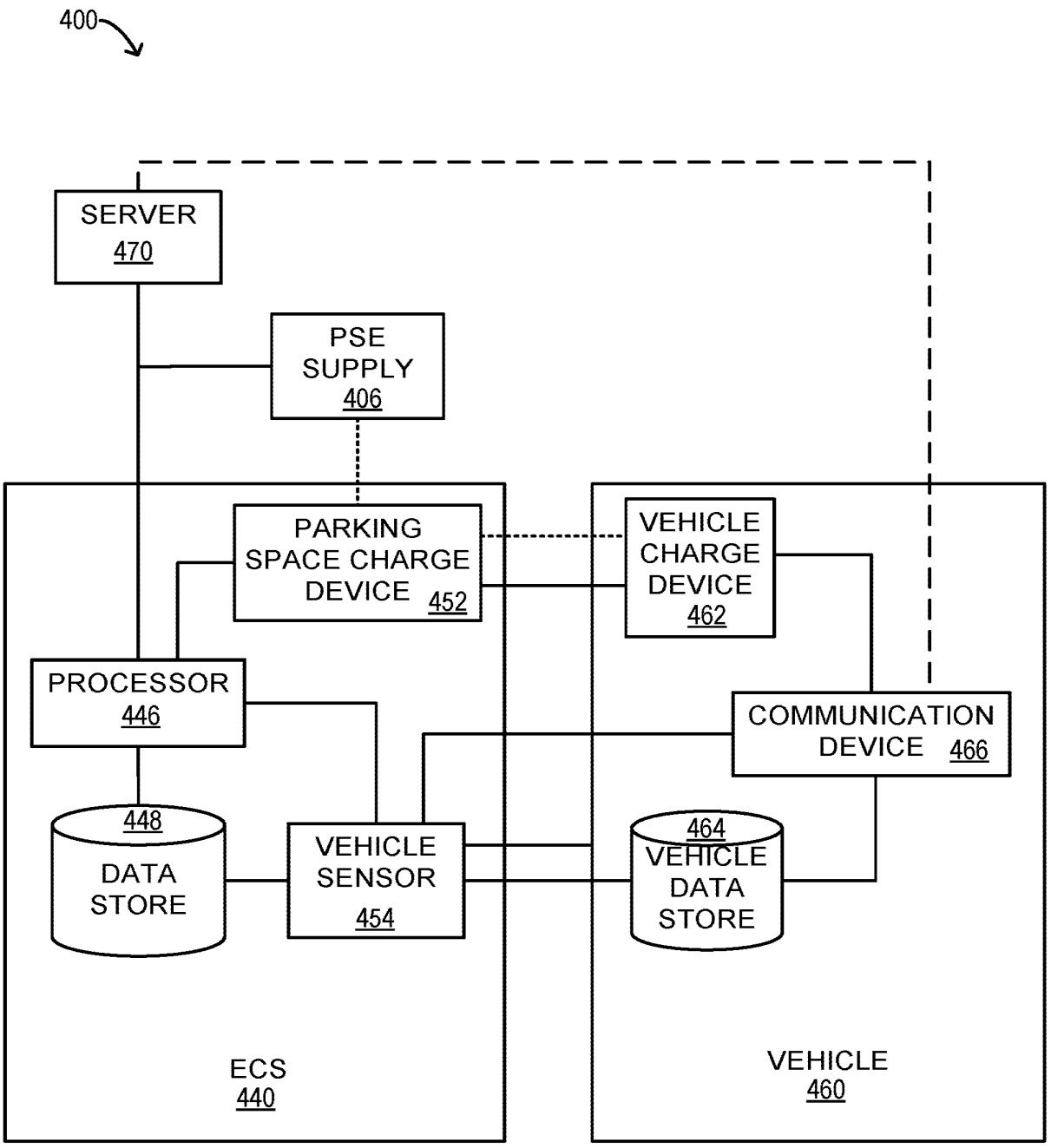
VEHICLE
VEHICLE
VEHICLE

FIG. 3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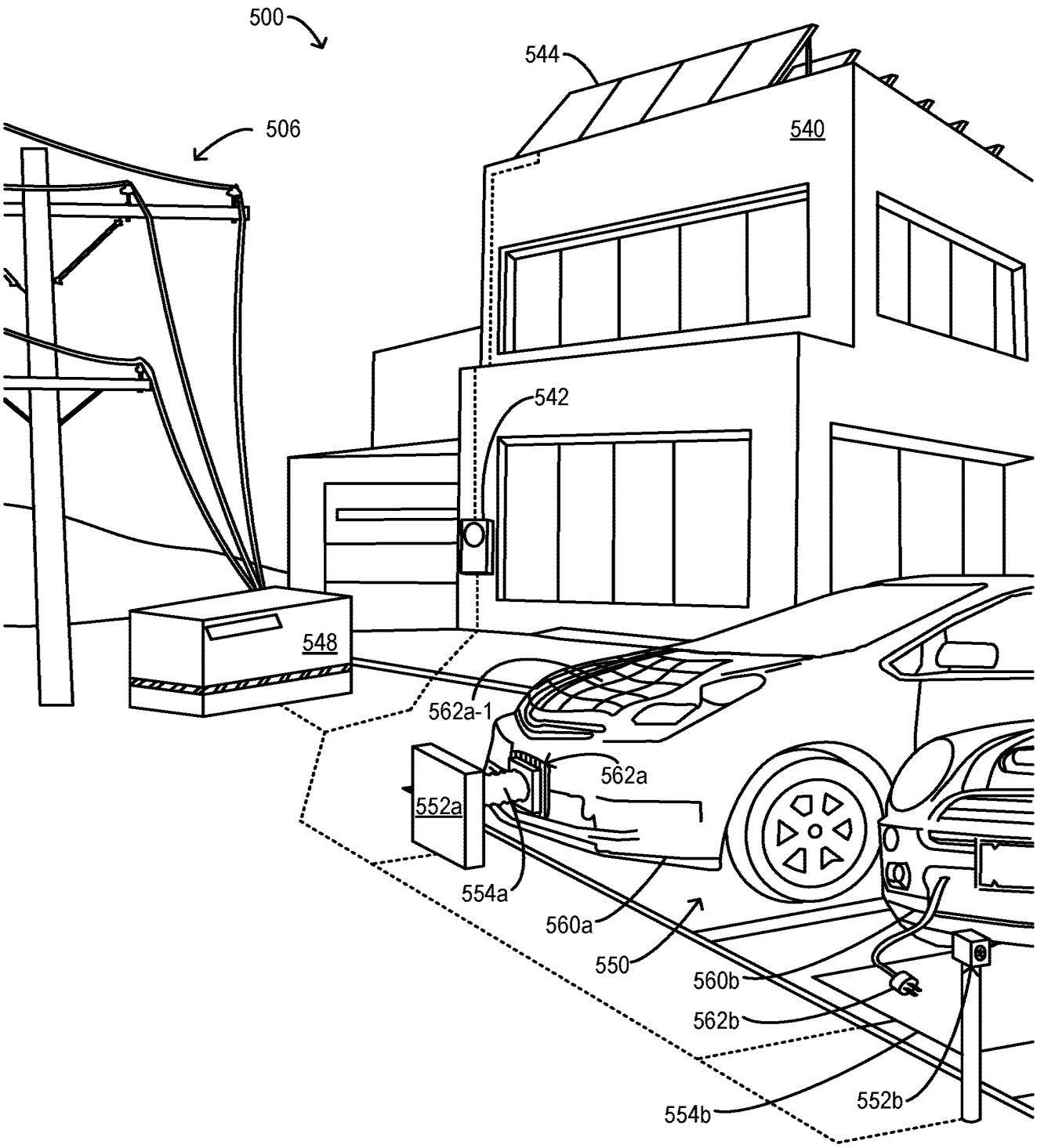
PSE
SUPPLY
406
PARKING
SPACE CHARGE
DEVICE
452
VEHICLE
CHARGE
DEVICE
462
PROCESSOR
446
COMMUNICATION
DEVICE
466
448
DATA
STORE
VEHICLE
SENSOR
454
464
VEHICLE
DATA
STORE
ECS
440
VEHICLE
460

FIG. 4


500
544
506
540
542
548
562a-1
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552a
554a
560a
550
560b
562b
552b
554b

FIG. 5

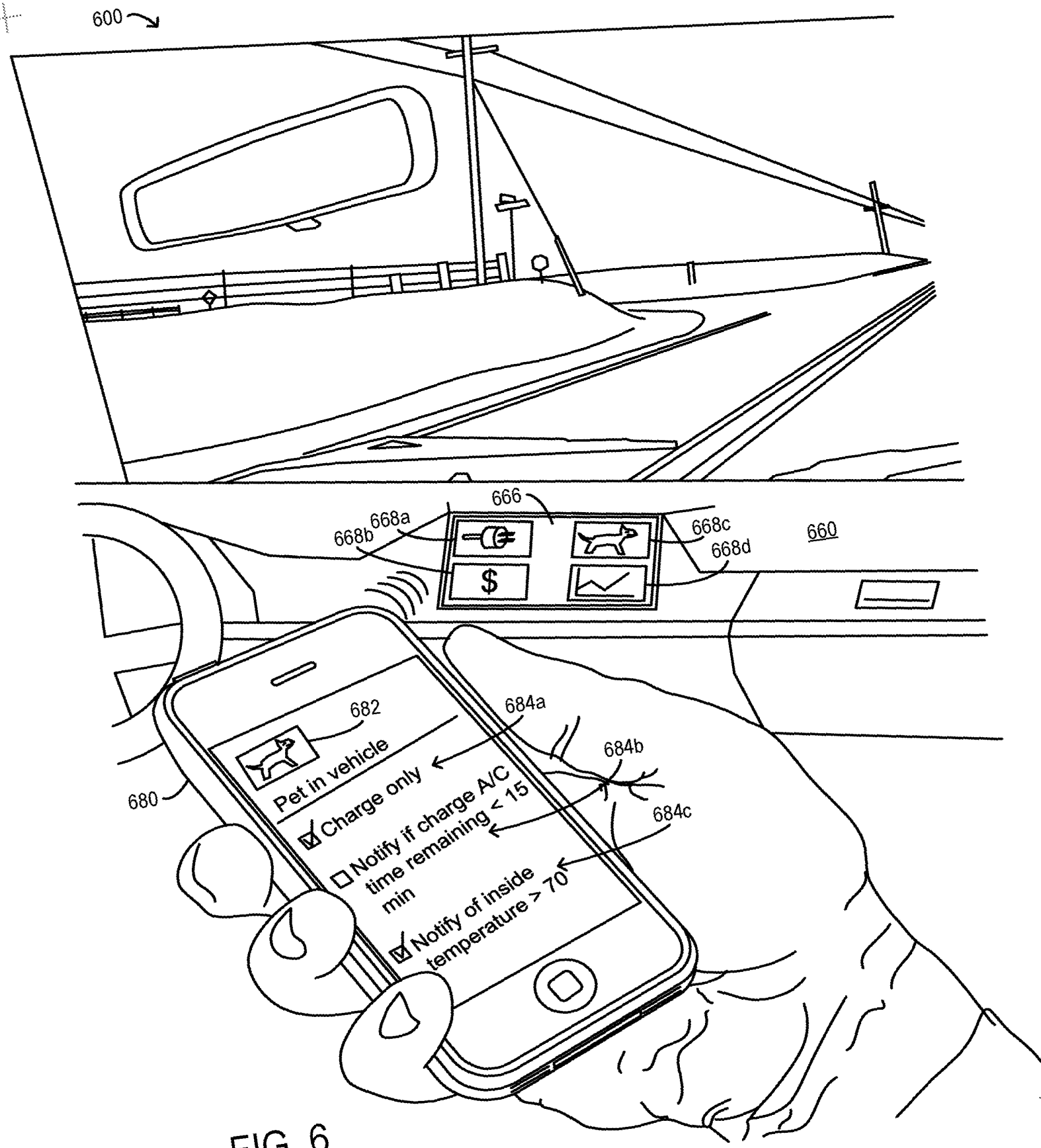
600
666
668a
668b
668c
668d
660
$
682
Pet in vehicle
680
684a
684b
684c
Charge only
Notify if charge A/C time remaining < 15 min
Notify of inside temperature > 70

FIG. 6

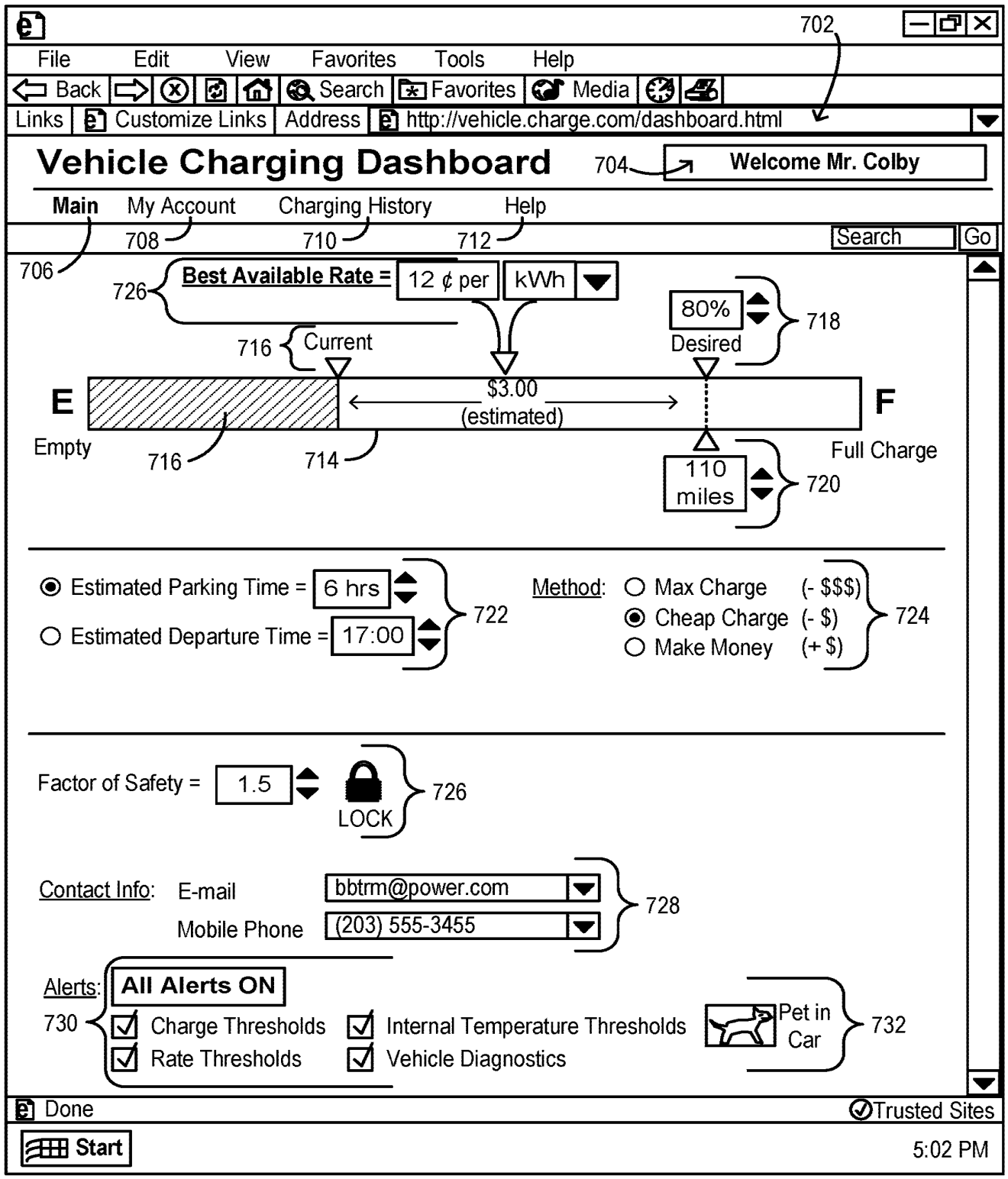
700
702
File Edit View Favorites Tools Help
Back Search Favorites Media
Links Customize Links Address http://vehicle.charge.com/dashboard.html
Vehicle Charging Dashboard
704
Welcome Mr. Colby
Main
My Account
Charging History
Help
706
708
710
712
Search
Go
726
Best Available Rate =
12 ¢ per
kWh
80%
Desired
718
716
Current
$3.00
(estimated)
E
Empty
F
Full Charge
716
714
110
miles
720
Estimated Parking Time =
6 hrs
Estimated Departure Time =
17:00
722
Method:
Max Charge (- $$$)
Cheap Charge (- $)
Make Money (+ $)
724
Factor of Safety =
1.5
LOCK
726
Contact Info:
E-mail
bbtrm@power.com
Mobile Phone
(203) 555-3455
728
Alerts:
All Alerts ON
730
Charge Thresholds
Internal Temperature Thresholds
Rate Thresholds
Vehicle Diagnostics
Pet in Car
732
Done
Trusted Sites
Start
5:02 PM

FIG. 7

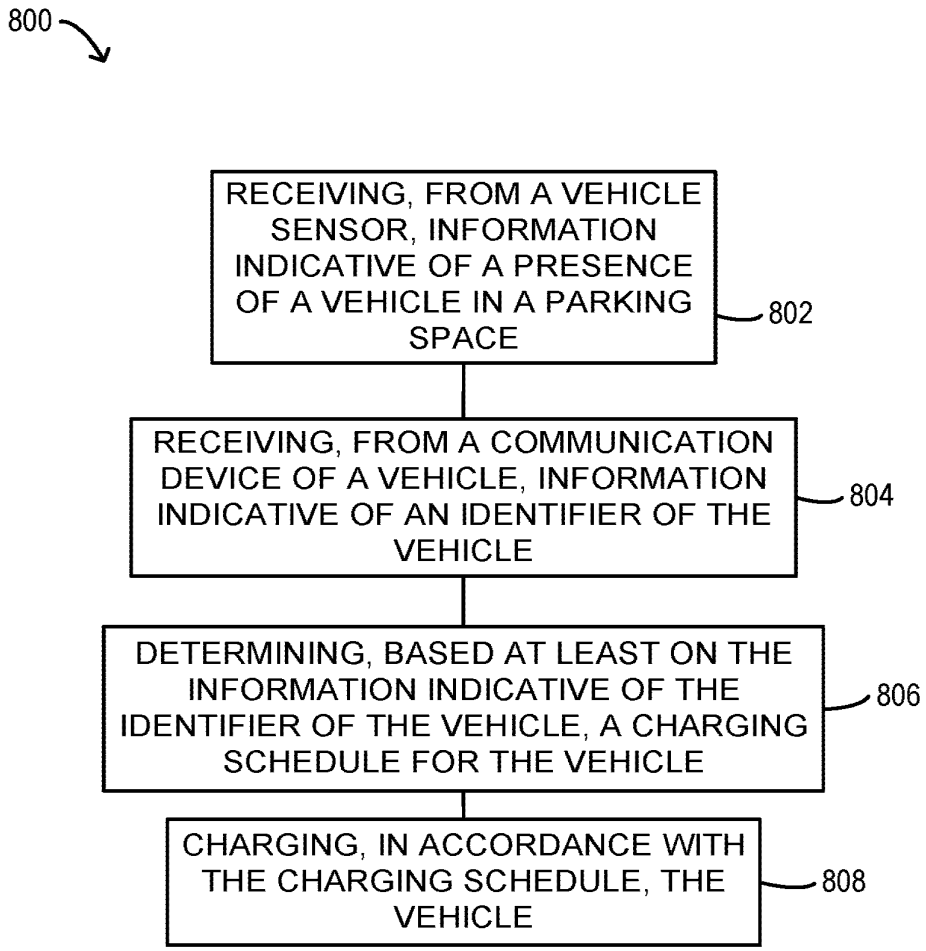
800
RECEIVING, FROM A VEHICLE SENSOR, INFORMATION INDICATIVE OF A PRESENCE OF A VEHICLE IN A PARKING SPACE
802
RECEIVING, FROM A COMMUNICATION DEVICE OF A VEHICLE, INFORMATION INDICATIVE OF AN IDENTIFIER OF THE VEHICLE
804
DETERMINING, BASED AT LEAST ON THE INFORMATION INDICATIVE OF THE IDENTIFIER OF THE VEHICLE, A CHARGING SCHEDULE FOR THE VEHICLE
806
CHARGING, IN ACCORDANCE WITH THE CHARGING SCHEDULE, THE VEHICLE
808

FIG. 8

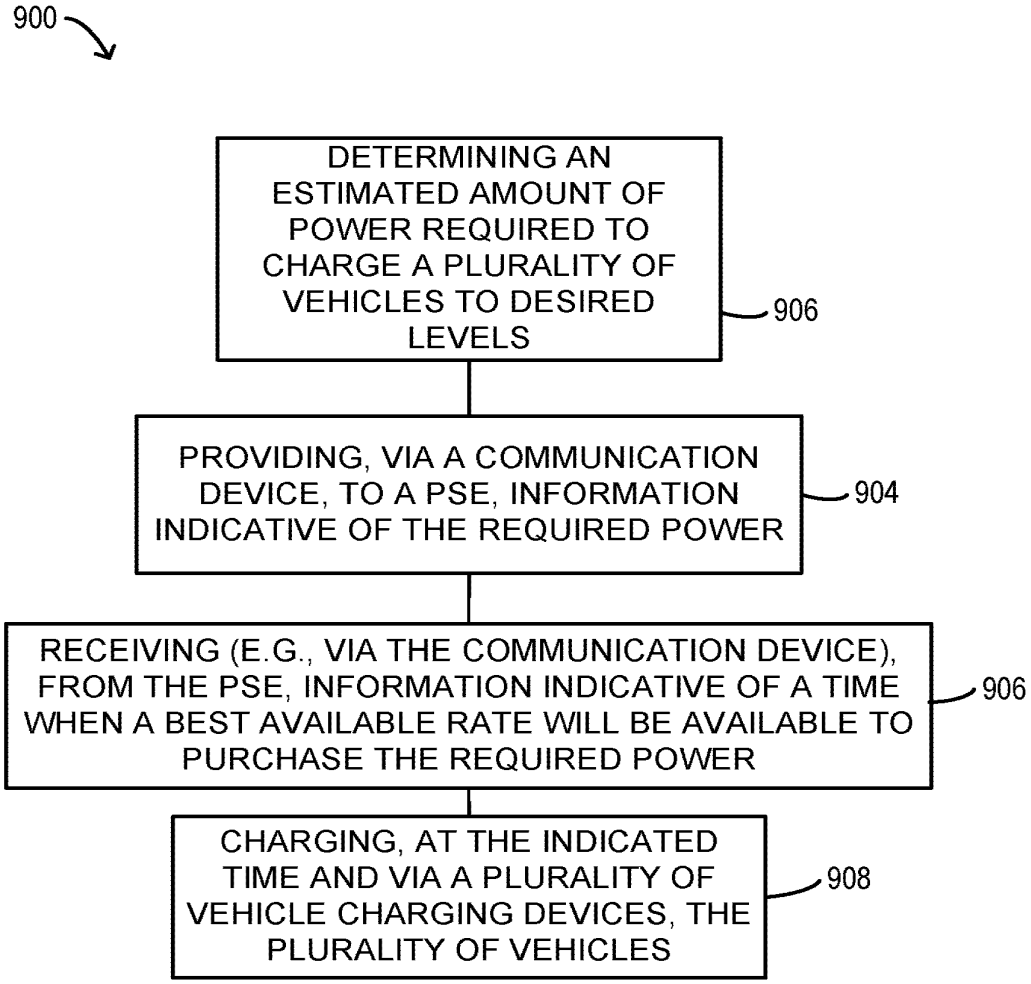
900
DETERMINING AN ESTIMATED AMOUNT OF POWER REQUIRED TO CHARGE A PLURALITY OF VEHICLES TO DESIRED LEVELS
906
PROVIDING, VIA A COMMUNICATION DEVICE, TO A PSE, INFORMATION INDICATIVE OF THE REQUIRED POWER
904
RECEIVING (E.G., VIA THE COMMUNICATION DEVICE), FROM THE PSE, INFORMATION INDICATIVE OF A TIME WHEN A BEST AVAILABLE RATE WILL BE AVAILABLE TO PURCHASE THE REQUIRED POWER
906
CHARGING, AT THE INDICATED TIME AND VIA A PLURALITY OF VEHICLE CHARGING DEVICES, THE PLURALITY OF VEHICLES
908

FIG. 9

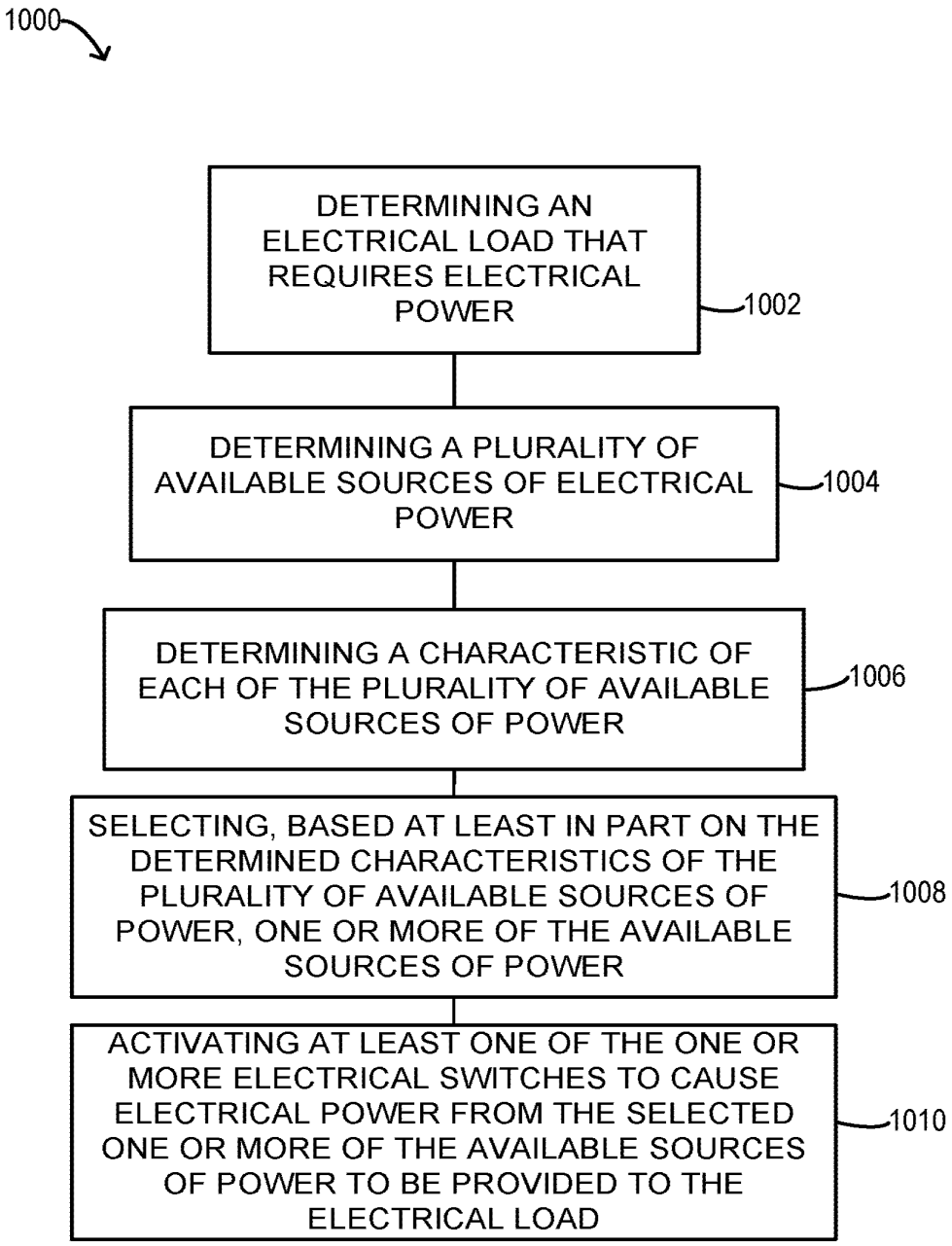
1000
DETERMINING AN ELECTRICAL LOAD THAT REQUIRES ELECTRICAL POWER
1002
DETERMINING A PLURALITY OF AVAILABLE SOURCES OF ELECTRICAL POWER
1004
DETERMINING A CHARACTERISTIC OF EACH OF THE PLURALITY OF AVAILABLE SOURCES OF POWER
1006
SELECTING, BASED AT LEAST IN PART ON THE DETERMINED CHARACTERISTICS OF THE PLURALITY OF AVAILABLE SOURCES OF POWER, ONE OR MORE OF THE AVAILABLE SOURCES OF POWER
1008
ACTIVATING AT LEAST ONE OF THE ONE OR MORE ELECTRICAL SWITCHES TO CAUSE ELECTRICAL POWER FROM THE SELECTED ONE OR MORE OF THE AVAILABLE SOURCES OF POWER TO BE PROVIDED TO THE ELECTRICAL LOAD
1010

FIG. 10

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/340,781	**06/23/2023 07:47:32 PM ET**	**CF01-001-02-07**

Title of Invention

SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8229	FILED BY	Carson Fincham
PATENT CENTER #	62329717	FILING DATE	-
CUSTOMER #	89411	FIRST NAMED INVENTOR	Mr. Jeffrey R. Ambroziak
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	-

Documents

TOTAL DOCUMENTS: 7

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
CF01-001-02-07_ADS_06-23-23.pdf	9	Application Data Sheet	2175 KB
CF01-001-02-07_REQ_PE_06-23-23.pdf	2	Track One Request	122 KB
CF01-001-02-07_COMB_06-23-23.pdf	3	Oath or Declaration filed	903 KB
CF01-001-02-07_FIG_06-23-23.pdf	10	Drawings-only black and white line drawings	245 KB
CF01-001-02-07_CON_06-23-23.pdf	37	-	342 KB

CF01-001-02-07_CON_06-23-23-SPEC.pdf	(1-32)	32	Specification	313 KB
CF01-001-02-07_CON_06-23-23-CLM.pdf	(33-36)	4	Claims	122 KB
CF01-001-02-07_CON_06-23-23-ABST.pdf	(37-37)	1	Abstract	116 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
CF01-001-02-07_ADS_06-23-23.pdf	4322C287D7C06F8B4C68B681D56BCC779A02C43706E12F681DC69B516F4DF3E102FE26CE6CB9388B82A964538CA47A45807C89737C95717C7AA7BC377969AB6A
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

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PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
	Application Number	
Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
Mr.	Jeffrey	R.	Ambroziak	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Guilford	State/Province	CT	Country of Residence	US

Mailing Address of Inventor:

Address 1	563 Lake Drive		
Address 2			
City	Guilford	State/Province	CT
Postal Code	06347	Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
Mr.	Carson	C.K.	Fincham	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Ridgefield	State/Province	CT	Country of Residence	US

Mailing Address of Inventor:

Address 1	125 Florida Road		
Address 2			
City	Ridgefield	State/Province	CT
Postal Code	06877	Country	CT

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
	Application Number	
Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

☐ **An Address is being provided for the correspondence Information of this application.**			
Customer Number	89411		
Email Address	docketing@rowantreelaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES		
Attorney Docket Number	CF01-001-02-07	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	10	**Suggested Figure for Publication (if any)**	7

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	89411		

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
	Application Number	
Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	17826229	2022-05-27

Prior Application Status	Patented		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17826229	Continuation of	17306776	2021-05-03	11631987	2023-04-18

Prior Application Status	Patented		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17306776	Continuation of	17012325	2020-09-04	10998753	2021-05-04

Prior Application Status	Patented		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17012325	Continuation of	15848017	2017-12-20	10819135	2020-10-27

Prior Application Status	Patented		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15848017	Continuation of	12/502041	2009-07-13	9853488	2017-12-26

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/502041	Claims benefit of provisional	61/134646	2008-07-11

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
	Application Number	
Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
	Application Number	
Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (01-22)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
	Application Number	
Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Charge Fusion Technologies, LLC

Mailing Address Information For Applicant:

Address 1	54 Danbury Road, Suite 302		
Address 2			
City	Ridgefield	**State/Province**	CT
Country	US	Postal Code	06877
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
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Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

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NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Carson C.K. Fincham, Reg.#54096/			Date (YYYY-MM-DD)	2023-06-23
First Name	Carson	Last Name	Fincham	Registration Number	54096

Additional Signature may be generated within this form by selecting the Add button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CF01-001-02-07
	Application Number	
Title of Invention	SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present Application claims benefit and priority under 35 U.S.C. §120 to, and is a Continuation of, U.S. Patent No. 17/826,229 filed on May 27, 2022 and titled "SYSTEMS AND METHODS FOR BI-DIRECTIONAL, REVERSE, AND COOPERATIVE CHARGING OF ELECTRIC VEHICLES", which itself claims benefit and priority to U.S. Patent No. 17/306,776 filed on May 3, 2021 and titled "SYSTEMS AND METHODS FOR CHARGING ELECTRIC VEHICLES", which issued as U.S. Patent No. 11,631,987 on April 18, 2023 and which itself claims benefit and priority to U.S. Patent Application No. 17/012,325 filed on September 4, 2020 and titled "SYSTEMS AND METHODS FOR CHARGING ELECTRIC VEHICLES UTILIZING A TOUCH-SENSITIVE INTERFACE", which issued as U.S. Patent No. 10,998,753 on May 4, 2021 and which itself claims benefit and priority to U.S. Patent Application No. 15/848,017 filed on December 20, 2017 and titled "SYSTEMS AND METHODS FOR CHARGING ELECTRIC VEHICLES UTILIZING A TOUCH-SENSITIVE INTERFACE", which issued as U.S. Patent No. 10,819,135 on October 27, 2020 and which itself claims benefit and priority to U.S. Patent Application No. 12/502,041 filed on July 13, 2009 and titled "SYSTEMS AND METHODS FOR ELECTRIC VEHICLE CHARGING AND POWER MANAGEMENT" which issued as U.S. Patent No. 9,853,488 on December 26, 2017 and which itself claims benefit and priority under 35 U.S.C. §119(e) to U.S. Provisional Patent Application Serial No. 61/134,646 filed July 11, 2008, entitled "SYSTEM AND METHOD OF DISTRIBUTION FOR CHARGING ELECTRIC VEHICLES", the entirety of each of which is incorporated by reference herein for all purposes.

BACKGROUND

[0002] Improvements in battery technology provide the potential of economically viable electric-powered modes of transportation including, but not limited to, automobiles, motorcycles, buses, etc. One oft cited drawback of such electrical vehicles is the need to plug them in regularly to replenish their electrical charge. First, such charging will likely require more time than is typically required to fill up an automobile with a petroleum based product. As a result, the owner of an electrical automobile must often times adhere to a schedule of charging that renders the automobile unusable for protracted stretches of time. In addition, there exists a resistance to performing the act of plugging in an automobile and subsequently unplugging the vehicle in order to maintain a charged vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] An understanding of embodiments described herein and many of the attendant advantages thereof may be readily obtained by reference to the following detailed description when considered with the accompanying

drawings, wherein:

FIG. 1 is a block diagram of a system according to some embodiments;

FIG. 2 is a block diagram of a system according to some embodiments;

FIG. 3 is a block diagram of a system according to some embodiments;

FIG. 4 is a block diagram of a system according to some embodiments;

FIG. 5 is a perspective diagram of a system according to some embodiments;

FIG. 6 is a perspective diagram of a system according to some embodiments;

FIG. 7 is a diagram of an exemplary interface according to some embodiments;

FIG. 8 is a flow diagram of a method according to some embodiments;

FIG. 9 is a flow diagram of a method according to some embodiments; and

FIG. 10 is a flow diagram of a method according to some embodiments

DETAILED DESCRIPTION

I. Introduction

[0004] Applicant has recognized that, in some situations, it may be advantageous to intelligently charge vehicles. In some embodiments, for example, intelligent vehicle charging may comprise receiving (*e.g.*, from a vehicle sensor) information indicative of a presence of a vehicle in a parking space. Intelligent charging may also or alternatively comprise receiving (*e.g.*, from a communication device) information indicative of an identifier of the vehicle, determining, based at least on the information indicative of the identifier of the vehicle, a charging schedule for the vehicle, and/or charging, in accordance with the charging schedule, the vehicle.

[0005] Applicant has also recognized that, in some situations, it may be advantageous to provide intelligent quantitative load balancing for vehicle charging. In some embodiments, for example, intelligent quantitative load balancing for vehicle charging may comprise determining an estimated amount of power required to charge a plurality of vehicles to desired levels. Intelligent quantitative load balancing for vehicle charging may also or alternatively comprise providing (*e.g.*, via a communication device), to a Power Supplying Entity (PSE), information indicative of the required power, receiving (*e.g.*, via the communication device), from the PSE, information indicative of a time when a best available rate will be available to purchase the required power, and/or charging, at the indicated time and via a plurality of vehicle charging devices, the plurality of vehicles.

[0006] Applicant has further recognized that, in some situations, it may be advantageous to provide intelligent qualitative load balancing for electrical loads (*e.g.*, vehicle charging). In some embodiments, for example, intelligent qualitative load balancing for electrical loads may comprise determining an electrical load that requires electrical power, determining a plurality of available sources of electrical power, determining a characteristic of each of the plurality of available sources of power, selecting, based at least in part on the determined

characteristics of the plurality of available sources of power, one or more of the available sources of power, and/or activating at least one of electrical switch to cause electrical power from the selected one or more of the available sources of power to be provided to the electrical load.

II. Terms and Definitions

[0007] Throughout the description that follows and unless otherwise specified, the following terms may include and/or encompass the example meanings provided in this section. These terms and illustrative example meanings are provided to clarify the language selected to describe embodiments both in the specification and in the appended claims, and accordingly, are not intended to be limiting.

[0008] Some embodiments described herein are associated with a "Power Supplying Entity (PSE)". As used herein, the terms "power supplying entity" and "PSE" may generally be utilized interchangeably and may generally refer to any entity (*e.g.*, person, company, and/or organization or group) that is associated with the generation and/or provision, transmission, storage, and/or conversion of electrical energy. A PSE device may comprise any type of device associated with such generation and/or provision, transmission, storage, and/or conversion of electrical energy. Examples of PSE devices may include, but are not limited to, a power generation unit (*e.g.*, a gas, coal, oil, biomass, and/or solar boiler and/or generator), a power generation facility (*e.g.*, a hydroelectric facility), electric transmission lines, a transformer and/or inverter, a battery, a meter, and/or a capacitor.

[0009] Some embodiments described herein are associated with an "Electric Charging System (ECS)". As used herein, the terms "electric charging system" and "ECS" may generally be utilized interchangeably and may generally refer to any combination of hardware, software, firmware, and/or microcode that is operative to conduct, manage, schedule, and/or otherwise facilitate the charging of one or more vehicles. As utilized in some embodiments, an ECS may comprise a system configured to charge a plurality of vehicles (such as electric and/or hybrid-electric vehicles) parked in a parking lot and coupled to accept (*e.g.*, from the ECS and/or a component thereof) electrical power. In some embodiments, such vehicles may be coupled to accept electrical power from an ECS in a wired and/or wireless fashion.

[0010] As used herein, the term "electric vehicle" may generally refer to any vehicle that utilizes, stores, and/or provides electrical power (*e.g.*, buses, trains, cars, semi-trucks, ships, submarines, aircraft, dirt bikes, All Terrain Vehicles (ATV), scooters, and/or lawn mowers). Almost all typical vehicles comprise a battery, for example, and would thus qualify as "electric vehicles". Similarly, the term "electric car" as utilized herein may generally refer to any electric vehicle that may suitably be described as a car. This may include, in some embodiments, passenger cars of any size or class or configuration, passenger trucks such as pickup trucks, vans, etc. Some embodiments are more specifically directed to and/or may be particularly advantageously applied to certain types or classes of electric vehicles and/or electric cars. Electric-drive vehicles or "True Electric Cars (TEC)", for example, comprise

a class of vehicles that derive power (and thus motion) by utilizing one or more electric motors. Some electric-drive vehicles may store energy for powering such motors in one or batteries (the typical configuration for a TEC). Some electric-drive vehicles may instead utilize power obtained from operation of a small internal combustion engine, fuel cell, or the like. This class of vehicle is typically referred to as a "hybrid" electric vehicle.

[0011] Some embodiments described herein are associated with a "control system". As used herein, the term "control system" may generally refer to any combination of hardware, software, firmware, and/or microcode that is operative to carry out and/or facilitate embodiments described herein. For example, a control system may comprise a processor performing instructions of a program to facilitate intelligent vehicle charging. The control system may comprise, according to some embodiments, a single device and/or component or may comprise any practicable number of networked devices.

[0012] Some embodiments described herein are associated with a "network device". As used herein, the term "network device" may generally refer to any device that can communicate via a network. Examples of network devices include a PC, a workstation, a server, a printer, a scanner, a facsimile machine, a copier, a PDA, a storage device (*e.g.*, a disk drive), a hub, a router, a switch, and a modem or a wireless phone. In some embodiments, network devices may comprise one or more network components, such as a Static Random Access Memory (SRAM) device or module, a network processor, and/or a network communication path, connection, port, or cable. Some examples of network devices may include, but are not limited to, servers or controllers, customer devices, vehicles and/or vehicle components, input devices, output devices, and peripheral devices.

[0013] As used herein, the terms "server" and "controller" may be used interchangeably and may generally refer to any device that may communicate with one or more vehicles, PSE devices, ECS devices, one or more third-party servers, one or more remote controllers, one or more customer devices, one or more peripheral devices and/or other network nodes, and may be capable of relaying communications to and/or from each such device. A controller or server may, for example, comprise one or more network devices and/or components.

[0014] Some embodiments described herein are associated with an "input device". As used herein, the term "input device" may generally refer to any device that is used to receive or process input. An input device may communicate with and/or be part of another device (*e.g.*, a wagering game device). Some examples of input devices include, but are not limited to: a button, a key, one or more softkeys and/or variable function input devices, a bar-code scanner, a magnetic stripe reader, a computer keyboard, a pointing device (*e.g.*, a computer mouse, touchpad, and/or trackball), a point-of-sale terminal keypad, a touch-screen, a microphone, an infrared sensor, a sonic ranger, a computer port, a video camera, a motion detector, an accelerometer, a thermometer, a digital camera, a network card, a Universal Serial Bus (USB) port, a Global Positioning System (GPS) receiver, a Radio Frequency IDentification (RFID) receiver, a RF receiver, a pressure sensor, and a weight scale or mass balance.

[0015] Some embodiments described herein are associated with an "output device". As used herein, the term "output device" may generally refer to a device that is used to output information. An output device may

communicate with and/or be part of another device. Some examples of output devices may include, but are not limited to: a Cathode Ray Tube (CRT) monitor, a Liquid Crystal Display (LCD) screen, a Light Emitting Diode (LED) screen, a printer, an audio speaker (or other sound or noise-producing device), an Infra-red Radiation (IR) transmitter, a RF transmitter, a vibration device, an olfactory emitter, and/or a data port.

[0016] It should be understood that some devices may function and/or operate as both input and output devices. A touch-sensitive display device (or "touch screen"), for example, may both receive input by receiving pressure and/or electrostatic indications via a display screen and may also provide output such as graphics, text, and/or other data via the same display screen.

[0017] Some embodiments herein are associated with "communication". As used herein, the term "communication" may refer to any information, data, and/or signal that is provided, transmitted, received, and/or otherwise processed by an entity, and/or that is shared or exchanged between two or more people, devices, and/or other entities. Communications may be external to one or more devices, internal (*e.g.*, within a device and/or component), wired, wireless, continuous, and/or intermittent. Communications may involve, for example, one or more of transmitting, receiving, relaying, processing, and/or otherwise interfacing with information and/or data. Some, but not all, possible communication networks that may be utilized for such communications include: a Local Area Network (LAN), a Wide Area Network (WAN), the Internet, a telephone line (*e.g.*, a Public Switched Telephone Network (PSTN)), a cable line, a radio channel, an optical communications line, and/or a satellite communications link. A variety of communications protocols may be utilized to facilitate and/or conduct such communications, including but not limited to: Ethernet (or IEEE 802.3), Internetwork Packet Exchange IPX), Service Advertising Protocol (SAP), Asynchronous Transfer Protocol (ATP), Bluetooth®, and/or Transmission Control Protocol (TCP)/Internet Protocol (IP). Communications may be encrypted to ensure privacy and prevent fraud in any of a variety of ways that are or become known or practicable.

[0018] Devices in communication with each other need not be continually transmitting to each other. On the contrary, such devices need only transmit to each other as necessary, and may actually refrain from exchanging data most of the time. For example, a device in communication with another device via the Internet may not transmit data to the other device for weeks at a time.

[0019] As used herein, the terms "information" and "data" may be used interchangeably and may refer to any data, text, voice, video, image, message, bit, packet, pulse, tone, waveform, and/or other type or configuration of signal and/or information. Information may be or include information packets transmitted, for example, in accordance with the IP Version 6 (IPv6) standard as defined by "Internet Protocol Version 6 (IPv6) Specification" RFC 1883, published by the Internet Engineering Task Force (IETF), Network Working Group, S. Deering et al. (December 1995). Information may, according to some embodiments, be compressed, encrypted, and/or otherwise packaged or manipulated in accordance with any method that is or becomes known or practicable.

[0020] In addition, some embodiments described herein are associated with an "indication". As used herein, the term "indication" may be used to refer to any indicia and/or other information indicative of or associated with a subject, item, entity, and/or other object and/or idea. As used herein, the phrases "information indicative of" and "indicia" may be used to refer to any information that represents, describes, and/or is otherwise associated with a related entity, subject, or object. Indicia of information may include, for example, a code, a reference, a link, a signal, an identifier, and/or any combination thereof and/or any other informative representation associated with the information. In some embodiments, indicia of information (or indicative of the information) may be or include the information itself and/or any portion or component of the information. In some embodiments, an indication may include a request, a solicitation, a broadcast, and/or any other form of information gathering and/or dissemination.

[0021] As used herein, the term "coupled" may generally refer to any type or configuration of coupling that is or becomes known or practicable. Coupling may be descriptive, for example, of two or more objects, devices, and/or components that are communicatively coupled, mechanically coupled, electrically coupled, and/or magnetically coupled. The term "communicatively coupled" generally refers to any type or configuration of coupling that places two or more objects, devices, components, or portions, elements, or combinations thereof in communication. Mechanical, electrical, and magnetic communications are examples of such communications. The term "mechanically coupled" generally refers to any physical binding, adherence, attachment, and/or other form of physical contact between two or more objects, devices, components, or portions, elements, or combinations thereof.

[0022] The term "electrically coupled" indicates that one or more objects, devices, components, or portions, elements, or combinations thereof, are in electrical contact such that an electrical signal, pulse, or current (*e.g.*, electrical energy) is capable of passing between the one or more objects, enabling the objects to electrically communicate with one another. In some embodiments, electrical coupling may enable electrical energy to be transmitted wirelessly between two or more objects and/or devices. The term "magnetically coupled" indicates that one or more objects, devices, components, or portions, elements, or combinations thereof, are within one or more associated magnetic fields. Objects may be electrically and/or magnetically coupled without themselves being physically attached or mechanically coupled. For example, objects may communicate electrically through various wireless forms of communication or may be within (at least partially) a magnetic field, without being physically touching or even adjacent.

III. General Electrical Distribution Systems

[0023] Referring first to FIG. 1, a block diagram of a system 100 according to some embodiments is shown. The various systems described herein are depicted for use in explanation, but not limitation, of described

embodiments. Different types, layouts, quantities, and configurations of systems described herein may be utilized without deviating from the scope of some embodiments.

[0024] According to some embodiments, the system 100 may comprise one or more power sources 102 that are coupled to provide electrical power to one or more power distribution networks 104, which are commonly referred to as electrical "grids". Such electrical grids 104 may, in some embodiments, be coupled via inter-grid distribution lines 106. While such inter-grid power transfer couplings are generally referred to as transmission lines, it should be understood that other forms of inter-grid power transfer couplings may also or alternatively be utilized, whether or not they actually comprise lines, wires, or other physical electrical conduits (*e.g.*, RF and/or microwave wireless power transmission).

[0025] In some embodiments, the system 100 may comprise one or more electrical demands or loads and/or types of such loads to which the electrical grid 104 provides electrical energy. The system 100 may comprise, for example, a residential demand 110, a transportation demand 120, an industrial demand 130, and/or a commercial demand 140. In some embodiments, the system 100 may comprise fewer or more types of electrical demands 110, 120, 130, 140 than are shown in FIG. 1. According to some embodiments, any of the various types of electrical demands 110, 120, 130, 140 may be comprised of one or more electrical loads, nodes, and/or other types and/or configurations of electrical demands.

[0026] In some embodiments, electrical energy from the one or more power sources 102 may be "intelligently" directed, via the grid 104 (and/or specific components thereof not explicitly shown in FIG. 1), to selected electrical nodes or loads and/or to selected types of electrical demands 110, 120, 130, 140. According to some embodiments, one or more of the electrical demands 110, 120, 130, 140 may communicate with the grid 104 to schedule specific known and/or estimated electrical demands or loads. Such scheduling may, for example, be configured to reduce the cost of any such specific known and/or estimated electrical demands or loads (*e.g.*, by taking advantage of time-of-day rates) and/or may be configured to more efficiently manage electrical generation (*e.g.*, by the one or more power sources 102) and/or transmission (*e.g.*, via the grid 104).

[0027] Turning to FIG. 2, a block diagram of a system 200 according to some embodiments is shown. In some embodiments, the system 200 may be similar in configuration and/or functionality to the system 100 of FIG. 1. As shown in FIG. 2, for example, the system 200 may comprise a hydroelectric facility 202 coupled to provide power to a power distribution network/grid 204. The system 200 may also or alternatively comprise transmission lines 206, which may for example, carry electrical energy from the hydroelectric facility 202 to and/or through the grid 204 and/or to one or more other grids (not shown in FIG. 2). The transmission lines 206 may also or alternatively carry electrical energy to one or more of a residential subdivision 210, an electric train facility 220 (*e.g.*, a train station and/or electric train tracks – "third" rails and/or overhead lines), a factory 230, and/or an office building 240. In some embodiments, any or all components 202, 204, 206, 210, 220, 230, 240 of the system 200 may be similar in configuration and/or functionality to any similarly named and/or numbered components of FIG. 1.

[0028] According to some embodiments, electrical energy from the hydroelectric facility 202 may be "intelligently" directed by the grid 204 to, for example, the office building 240. Such direction may be effectuated in response to one or more specific parameters such ed one or more specific characteristics associated with the hydroelectric facility 202 and/or the office building 240. Such direction may be effectuated via management of one or more electrical switching devices (not explicitly shown in FIG. 2) or may only be "virtually" directed (or re-directed). The grid 204 may, for example, cause one or more electrical switches or gates to be activated (or deactivated), thus sending power from the hydroelectric facility 202 to the office building 240. Some or all of the electrical energy from the hydroelectric facility 202 may be directed to the office building 240 in such a manner.

[0029] In some embodiments, the direction of the electrical energy may only be "virtual". While no specific electrical switching may be effectuated, for example, and thus no specific electrical energy may be directed (or re-directed), the office building 240 may be specifically allotted an amount of energy produced by the hydroelectric facility 202. Such "virtual" redirection is similar to the currently utilized process of allocating or attributing a certain amount of energy from a certain type of power source to a specific customer and/or load (*e.g.*, such as when electric utility customers designate that "their" energy come only from renewable power sources).

[0030] In some embodiments, the office building 240 (and/or the residential subdivision 210, the electric train facility 220, and/or the factory 230) may be tasked with and/or configured to charge electric, hybrid-electric, and/or other types of vehicles. The parking lot shown at the office building 240 may, for example, be outfitted to charge one or more vehicles (not shown in FIG. 2) parked therein. In such embodiments, the office building 240 (and/or an entity associated therewith, such as a parking lot management company) may communicate with the grid 204 to schedule and/or otherwise manage the charging of the vehicles.

IV. Electric Car Charging Systems

[0031] Referring to FIG. 3, for example, a block diagram of a system 300 according to some embodiments is shown. In some embodiments, the system 300 may be similar in configuration and/or functionality to the systems 100, 200 of FIG. 1 and/or FIG. 2 herein. As shown in FIG. 3, for example, the system 300 may comprise a Power Supplying Entity (PSE) supply line 304 coupled to provide power to an Electrical Charging System (ECS) 340. The ECS 340 may comprise one or more electrical meters 342a-b and/or a processor 346. In some embodiments, the ECS 340 may also comprise or be associated with a power management device 348. The system 300 may also or alternatively comprise a parking lot 350 containing one or more parked vehicles 360. In some embodiments, any or all components 304, 340 of the system 300 may be similar in configuration and/or functionality to any similarly named and/or numbered components of FIG. 1 and/or FIG. 2 herein.

[0032] According to some embodiments, the system 300 may be utilized to provide electrical charging services to the one or more vehicles 360. It should be understood that fewer or more vehicles 360 than are shown in FIG.

3 may be included in the system 300. In some embodiments, the ECS 340 and/or the power management device 348 may communicate with one or more of the vehicles 360 and/or may otherwise obtain information associated with the one or more vehicles 360. The ECS and/or the power management device 348 may, for example, electronically receive information from each vehicle 360 and/or may communicate with a server and/or controller (neither of which is explicitly shown in FIG. 3) to receive information associated with each vehicle 360. Such information may then, for example, be utilized to determine how and/or when to charge each vehicle 360.

[0033] In some embodiments, the ECS 340 may communicate with a PSE (*e.g.*, that operates and/or provides the supply line 304) to determine time-of-day rates for purchasing electrical energy. The ECS 340 and/or the processor 346 thereof may then, for example, utilize the time-of-day rate information to determine a schedule for charging the one or more vehicles 360, such that the schedule results in the lowest estimated cost for charging the one or more vehicles 360. The ECS 340 may also or alternatively communicate with the PSE to otherwise develop a charging schedule such as to facilitate management of electrical energy generation (*e.g.*, by assisting in flattening usage peaks or spikes) or making use of available excess capacity.

[0034] According to some embodiments, the processer 346 may communicate with the electrical meters 342a-b to determine where any electrical energy required by the ECS 340 should be drawn from. In some embodiments, the processor 346 may be included in a single device with one or more of the electrical meters 342a-b (*e.g.*, the combination comprising a single "smart" meter). In the case that one or more of the vehicles 360 comprise batteries and/or electrical generation capabilities (*e.g.*, solar panels), for example, the ECS 340 may have the option of drawing electricity from the supply line 304 or the parking lot 350 (*e.g.*, the collective power available from the vehicles 360). In some embodiments, the processor 346 may determine which available source has cheaper and/or otherwise more desirable energy (*e.g.*, from "green" sources).

[0035] In some embodiments, the power management device 348 may comprise one or more transformers, inverters, filters, switches, gates, and/or other electrical load balancing and/or management devices. The power management device 348 may comprise, for example, an inverter for converting Alternating Current (AC) energy to Direct Current (DC) energy, and/or vice versa. It is anticipated, in accordance with some embodiments, that electric vehicles, hybrid-electric vehicles, and/or other vehicles requiring electrical charging (and/or providing electrical energy) may be configured to require (and/or provide) DC energy (*e.g.*, provided to and/or from one or more batteries).

[0036] In some embodiments, the power management device 348 may manage the charging of the vehicles 360. The In some embodiments, the power management device 348 may, for example, communicate with the vehicles 360 to determine charging requirements and/or may couple to the vehicles to provide wired and/or wireless electrical energy transfer (*e.g.*, charging). In some embodiments, the power management device 348 may also or alternatively manage (alone or in coordination with or conjunction with the processor 346 and/or the electrical meters 342a-b) the flow of electrical energy between the parking lot 350 and the ECS 340.

[0037] The power management device 348 may, such as in the case that at least some of the vehicles 360 are equipped to provide electrical energy (*e.g.*, via electrical generation devices and/or from on-board stored energy sources) for example, utilize any energy provided by one or more vehicles 360 to satisfy (in part or in whole) the charging demands of one or more other vehicles 360. Any net extra energy provided by the parking lot 350 may then, for example, be provided for use by the ECS 340 and/or for selling back to the PSE via the supply line 304.

[0038] Turning now to FIG. 4, a block diagram of a system 400 according to some embodiments is shown. In some embodiments, the system 400 may be similar in configuration and/or functionality to the systems 100, 200, 300 of FIG. 1, FIG. 2, and/or FIG. 3 herein. As shown in FIG. 4, for example, the system 400 may comprise a PSE supply 404 coupled to provide power to an ECS 440. The ECS 440 may comprise various components such as a processor 446 and/or a data store 448. In some embodiments, the ECS 440 may comprise and/or the PSE supply 404 may provide power directly to one or more parking space charge devices 452. The ECS 440 may, in some embodiments, comprise one or more vehicle sensors 454. According to some embodiments, the system 400 may comprise one or more vehicles 460. Any or all of the one or more vehicles 460 may comprise a vehicle charge device 462, a vehicle data store 464, and/or a communication device 466. The system 400 may also or alternatively comprise a server 470. In some embodiments, any or all components 404, 440, 446, 448, 460 of the system 400 may be similar in configuration and/or functionality to any similarly named and/or numbered components of FIG. 1, FIG. 2, and/or FIG. 3 herein.

[0039] In some embodiments, the ECS 440 may be coupled to provide and/or receive electric energy to/from the vehicle 460. As shown in FIG. 4, for example, the parking space charge device 452 may be physically and/or electrically coupled to the vehicle 460 and/or the vehicle charge device 462 thereof. The parking space charge device 452 may, in some embodiments, comprise a wireless charging device configured and coupled to provide electrical energy to the vehicle 460 and/or the vehicle charge device 462 and/or may comprise a physically coupling device configured to mate with the vehicle 460 and/or the vehicle charge device 462.

[0040] According to some embodiments, the vehicle sensor 454 may be coupled (such as in and/or near a parking space) to detect an arrival, proximity, and/or presence of the vehicle 460. The vehicle sensor 454 may, for example, comprise a magnetically actuated device that reacts to the large volume of metal that many vehicles are comprised of, and/or may comprise a pressure sensor (*e.g.*, to detect the weight/mass of the vehicle 460), a motion sensor (which may include both electrical and non-electric devices), and/or other electronic devices. In some embodiments, the vehicle sensor 454 may comprise a communication device such as a Bluetooth® and/or passive-inductive device that is operable to detect the presence of the vehicle 460 utilizing wireless interrogation methodologies. In such a manner, for example, the vehicle sensor 454 may communicate with the communication device 466 and/or the vehicle data store 464, both of the vehicle 460.

[0041] According to some embodiments, the vehicle sensor 454 may receive data from the communication device 466 and/or the vehicle data store 464. The vehicle sensor 454 may receive, for example, an indication of

an identifier of the vehicle 460 such as a Vehicle Identification Number (VIN), a license plate number, an electric utility account number, an EZ-Pass® account and/or tag number, and/or another identifier or account number such as a PayPal® account number. Such identifying information may be stored, for example, in the vehicle data store 464 and may be communicated directly to the vehicle sensor 454 of the ECS 440 or via the communication device 466 of the vehicle 460. In some embodiments, other information may also or alternatively be provided by the vehicle 460 to the ECS 440. Preference data defining, at least in part for example, desired vehicle charging parameters, charging schedules, and/or rules regarding how, when, and/or where (*e.g.*, designating specific parking spaces and/or parking lots) the vehicle 460 should be charged and/or how, when, and/or where electrical energy should be received from the vehicle 460 (*e.g.*, via generation of energy by the vehicle 460 and/or via discharging of one or more batteries or capacitors on the vehicle 460).

[0042] In some embodiments, preference data may be received from the vehicle 460 (*e.g.*, as stored in the vehicle data store 464 and/or may be retrieved and/or looked-up in the data store 448 of the ECS 440 and/or via the server 470. The processor 446 may, for example, utilize an identifier of the vehicle 460 (*e.g.*, received by the vehicle sensor 454) to query the vehicle data store 464, the data store 448, and/or the server 470. Preference data associated with the identifier of the vehicle 460 may accordingly be identified, selected, retrieved, and/or otherwise determined (*e.g.*, encoded and/or encrypted identification and/or preference data may be retrieved and then decoded and/or decrypted as needed).

[0043] According to some embodiments, the processor 446 may utilize the identification and/or preference data to determine, select, calculate, and/or otherwise derive a charging schedule for the vehicle 460. Similarly, in the case that the vehicle 460 is configured to provide electrical energy to the ECS 440, the processor 446 may utilize the identification and/or preference data to determine, select, calculate, and/or otherwise derive a schedule and/or routine (*e.g.*, rules-based strategy) for receiving electrical energy from the vehicle 460.

[0044] In some embodiments, the processor 446 may determine (*e.g.*, by communicating with the PSE associated with the PSE supply 404) available market rates (*e.g.*, a time-of-day and/or usage-based rate schedule) for purchasing electrical energy from the PSE supply 404. The processor 446 may utilize such rate information in combination with the identification and/or preference information, for example, to determine the most cost-effective schedule for charging the vehicle 460. In the case that the preference information includes an indication of how much energy is desired to be stored by the vehicle 460 by a certain time, the processor 446 may calculate an estimated time to achieve the desired charge and may identify when, during the available charging window (*e.g.*, a time window bounded by the current time and the desired total charge end time) would be most cost effective (*e.g.*, cheapest) to acquire the desired estimated charge.

[0045] According to some embodiments, such as in the case one or more vehicles 460 in a parking lot (and/or adjacent lots or otherwise within a proximity) are scheduled to charge while one or more other vehicle 460 are scheduled to provide electrical energy to the ECS 440, the processor 446 may determine the charging schedule

of a vehicle 460 based at least in part on information regarding electrical energy provisioning by one or more other vehicles 460. In the case that it is determined that a vehicle 460 requires an amount of charge 'A', for example, and that one or more other vehicles 460 are estimated to be capable of providing the amount of charge 'A', the processor 446 may determine that the most cost-effective way of providing the charge to the vehicle 460 is to direct electrical energy from the one or more providing vehicles 460 to the vehicle in need of charge. A rate table and/or other rate and/or cost information associated with and/or descriptive of the provision of electrical energy from one or more vehicles 460 (*e.g.*, directly) to one or more other vehicles 460 may be utilized to facilitate a determination of whether purchasing power from the PSE would be more or less cost-effective than purchasing and/or otherwise acquiring the required power from distributed generation sources such as other vehicles 460 parked nearby (*e.g.*, more near than the nearest source utilized by the PSE).

[0046] In some embodiments, such as in the case that the server 470 manages and/or coordinates multiple ECS 440 facilities, the server 470 may communicate with the PSE supply 406 (and/or another or different device owned and/or operated by the PSE) to determine and/or facilitate determination and/or calculation of vehicles charging schedules. In such a manner, for example, the server 470 may be able to negotiate better rates and/or sooner charging times with the PSE by leveraging bulk electrical energy purchasing.

[0047] According to some embodiments, vehicle identification information and/or vehicle charging preferences and/or parameters may be communicated to the server 470 (and/or data store 448 of the ECS 440) via the communication device 466 of the vehicle 460. An operator of the vehicle 460 whom defines and/or provides such identification and/or preference information, for example, may utilize a navigational and/or other touch-screen or communication device 466 of the vehicle 460 to select, program, define, and/or transmit the desired data. In some embodiments, the communication device 466 may comprise a wireless and/or cellular communication device 466 such as an OnStar® system and/or a cellular telephone operated in proximity to the vehicle 460 (*e.g.*, connected through the vehicle via Bluetooth® technology such as utilized by Uconnect® systems).

[0048] Referring to FIG. 5, a block diagram of a system 500 according to some embodiments is shown. In some embodiments, the system 500 may be similar in configuration and/or functionality to the systems 100, 200, 300, 400 of FIG. 1, FIG. 2, FIG. 3, and/or FIG. 4 herein. As shown in FIG. 5, for example, the system 500 may comprise a PSE supply line 504 coupled to provide power to an ECS 540. The ECS 540 may comprise various components such as a meter 542. In some embodiments, the ECS 540 may comprise and/or the PSE supply line 504 may provide power directly to a power management device 548. In some embodiments, the ECS 540 may also or alternatively generate power such as via one or more distributed generation devices 544 (such as internal combustion generators, batteries, and/or renewable energy generators such as wind, hydro, and/or solar (as shown) generators).

[0049] The ECS 540 may, in some embodiments, comprise and/or be associated with a parking lot 550 comprising one or more parking space charge devices 552a-b and/or one or more vehicle sensors 554a-b.

According to some embodiments, the system 500 may comprise one or more vehicles 560a-b. Any or all of the one or more vehicles 560a-b may comprise a vehicle charge device 562a-b. Some vehicles 560a-b (or all vehicles 560a-b), such as the first vehicle 560a depicted in FIG. 5, may comprise a vehicle charge device 560a-1 that is operable to generate and/or otherwise provide electrical energy (*e.g.*, to the ECS 540 and/or to the PSE supply line 506). In some embodiments, any or all components 504, 540, 542, 548, 550, 552a-b, 554, 560a-b, 562a-b of the system 500 may be similar in configuration and/or functionality to any similarly named and/or numbered components of FIG. 1, FIG. 2, FIG. 3, and/or FIG. 4 herein.

[0050] In some embodiments, such as shown in FIG. 5, the ECS 540 may comprise an office and/or other building that includes and/or is otherwise associated with the parking lot 550 for vehicles 560a-b. The office building 540 may typically receive electrical power from the PSE supply line 506 via the power management device 548, which may comprise (as depicted) a transformer (*e.g.*, to step-down the voltage of the PSE supply line 506 to the desired voltage for utilization by the office building 540). The electrical energy flowing from the transformer 548 into the office building 540 may generally be monitored, tabulated, and/or recorded by the meter 542. In some embodiments, such as in the case that the office building 540 generates electrical power, such as via the distributed generation solar panels 544, the meter 542 may also monitor, tabulate, and/or record electrical energy provided and/or sold back to the PSE supply line 506 (*e.g.*, a meter 542 than can record bi-directional electrical flow and/or that can run backwards). In the case that the power management device 548 functions as an inverter to convert DC energy produced by the solar panels 544 into AC energy, the meter 542 may be positioned on the PSE-side of the electrical circuit (*e.g.*, as opposed to the ECS-side of the circuit as shown in FIG. 5).

[0051] In some embodiments, the parking space charge devices 552a-b may be positioned and/or configured to provide electrical energy from the PSE supply line 504 and/or the transformer/inverter 548 to the vehicles 560a-b. As shown in FIG. 5, the parking space charge devices 552a-b may be provided in various forms and/or configurations. A first parking space charge device 552a may comprise a fixed-position, shock-absorbing electrical contact device that is designed to physically and electrically couple with the first vehicle 560a, for example. The first vehicle charge device 562a of the first vehicle 560a may be configured to mate and/or otherwise couple with the first parking space charge device 552a such as by utilizing flat-plate contact and/or other forms of electrical connections (*e.g.*, male/female connections of any know or practicable type).

[0052] According to some embodiments, a second parking space charge device 552b may simply comprise an electrical outlet that is configured to accept a second vehicle charge device 562b of the second vehicle 560b. Further, while not specifically or explicitly depicted in FIG. 5, a parking space charge device 552a-b may be configured to provide wireless transmission of electrical power to and/or from a vehicle 560a-b.

[0053] In some embodiments, the vehicle charge device 562a-1 may comprise an electrical energy generation device (such as the hood-mounted/integrated solar panels as shown in FIG. 5) that is coupled to provide power

to the first parking space charge device 552a. According to some embodiments, the vehicle charge device 562a-1 may comprise any device capable of providing electrical energy such as a battery, a capacitor, an engine powering an alternator, a wind power device, etc.

[0054] In some embodiments, as described herein, the vehicle sensors 554a-b may detect a proximity and/or presence of the vehicles 560a-b and/or may communicate with the vehicles 560a-b (*e.g.*, to receive and/or retrieve vehicle identification information and/or charging preference information). As shown in FIG. 5, a first vehicle sensor 554a may comprise a pressure sensor oriented and/or configured to detect a physical coupling of the first vehicle charge device 562a to the first parking space charge device 552a. In some embodiments, a second vehicle sensor 554b may comprise a ground-integrated pressure sensor (*e.g.*, to detect the weight/mass of a parked second vehicle 560b) and/or may comprise a magnetically-actuated device to detect the presence of large metal/ferrous components typically to be integrated into the second vehicle 560b. In some embodiments, the second vehicle sensor 554b may comprise a plurality of different types of sensors and/or may also or alternatively comprise an electronic communication device such as a Bluetooth® transceiver and/or a camera. The second vehicle sensor 554b may also or alternatively be utilized as a parking space charge device 552a-b that, for example, provides wireless power transmission from underneath the second vehicle 560b.

V. Electric Car Charging Interfaces

[0055] Turning now to FIG. 6, a perspective diagram of a system 600 according to some embodiments is shown. In some embodiments, the system 600 may be similar in configuration and/or functionality to the systems 100, 200, 300, 400, 500 of FIG. 1, FIG. 2, FIG. 3, FIG. 4, and/or FIG. 5 herein. The system 600 may comprise, for example, a vehicle 660 (a portion of the interior of which is depicted in FIG. 6) comprising a communication device 666. In some embodiments, the communication device 666 may provide a plurality of available menu options 668a-d. The system 600 may comprise, in some embodiments, a user device 680 comprising one or more menu options 682 and/or one or more charging preference options 684a-c.

[0056] In some embodiments, the system 600 may be utilized to setup, define, store, and/or update or change preference, option, and/or parameter data that is utilized by an ECS (not shown in FIG. 6) to determine how, when, and/or where to transfer electrical energy to and/or from the vehicle 660. An operator of the user device 680 may, for example, select the menu option 682 (and the user device 680 may receive an indication of such selection), which is depicted as being a menu option defining a situation of a pet being in the vehicle 660. The operator may then, for example, (i) determine whether it is desired that the vehicle 660 only be allowed to be charged in such a circumstance – as opposed to allowing the vehicle 660 to provide and/or sell stored and/or vehicle-generated power (*e.g.*, the first preference option 684a), (ii) determine whether it is desired that the operator be notified if the current charge level of the vehicle 660 falls below a level that allows the Air Conditioning

(A/C) to remain on for fifteen (15) minutes (*e.g.*, the second preference option 684b), and/or (iii) determine whether it is desired that the operator be notified if the temperature inside the vehicle 660 climbs above seventy (70) degrees (*e.g.*, the third preference option 684c).

[0057] In such a manner, for example, the user device 680 may receive indications of the desired parameters to be utilized in governing charging (and/or electrical transmission from) the vehicle 660. The user device 660 may then, for example, transmit indications of such preferences to a central server (not shown in FIG. 6; such as the server 470 of FIG. 4) and/or transmit indications of such preferences to the vehicle 660 (*e.g.*, via the communication device 666). An ECS may accordingly access such preference data and utilize the data to manage, define, and/or govern how, when, and/or where electrical energy is transmitted to and/or from the vehicle 660.

[0058] In some embodiments, such preference data may be defined, stored, managed, and/or updated or changed via the communication device 666. The operator of the vehicle 660 may, for example, select a first menu option 668a to define settings regarding desired charge levels, charging times, desired travel distances and/or itineraries, etc. The operator of the vehicle 660 may also or alternatively select a second menu option 668b to define settings regarding rules and/or parameters governing how electrical energy should be sold to the ECS. The operator of the vehicle 660 may also or alternatively select a third menu option 668c to define settings regarding rules and/or parameters governing how electrical energy should be received and/or provided and/or what types of alerts should be established when a pet is on the vehicle (*e.g.*, similar to the menu option 682 shown on the user device 680). The operator of the vehicle 660 may also or alternatively select a fourth menu option 668d to access current charge levels, battery statistics, charging history, electrical energy purchase and/or sale history, account balance information, etc.

[0059] Turning now to FIG. 7, a diagram of an exemplary interface 700 according to some embodiments is shown. In some embodiments, the exemplary interface 700 may be utilized in conjunction with and/or to effectuate and/or facilitate operation of the systems 100, 200, 300, 400, 500, 600 of FIG. 1, FIG. 2, FIG. 3, FIG. 4, FIG. 5, and/or FIG. 6 herein. The exemplary interface 700 may comprise, for example, a Uniform Resource Locator (URL) address bar 702 that shows the current Internet address of the displayed interface 700, a personalized welcome bar 704, and/or various menu and/or tab option such as a “main” menu item 706, a “My Account” menu item 708, a “charging history” menu item 710, and/or a “help” menu item 712.

[0060] The “My Account” menu item 708 may generally, for example, contain data descriptive of account setup and/or preference data such as billing parameters, contact information, etc. The “charging history” menu item 710 may generally contain data descriptive of metrics regarding how, when, and/or where a vehicle has been interfaced with an ECS. The “help” menu item 712 may generally provide data regarding help and assistance for using the interface 700 and/or for setting up various vehicle charging parameters and/or preferences.

[0061] In some embodiments, the "main" menu item 706 may comprise a "dashboard" and/or primary screen via which vehicle charging parameters may be established, stored, viewed, and/or changed. The "main" menu item 706 may comprise, for example, a vehicle charge indicator 714 that visually indicates a current charge level 716 of the vehicle. Similarly, a desired charge percent level 718 may be both shown and alterable. A user may select the desired charge percent level 718, for example, and may slide the marker on the vehicle charge indicator 714 to a new described location and/or may utilize the exemplary up/down arrow controls to increase or decrease the desired charge percent level 718.

[0062] The user may also or alternatively view and/or change the desired charge range level 720. An estimate of how far the vehicle can travel on a given charge amount (which may be a general average and/or may be computed based on a specific itinerary and/or past driving habits) can be determined, for example, and utilized to express the desired charge level in terms of distance capable of being traveled. In such a manner, for example, a user may determine a desired distance to travel (*e.g.*, how far it is from home to work or vice versa) and may set the desired charge range level 720 to match the desired distance.

[0063] In some embodiments, the "main" menu item 706 may comprise a time to charge definition field 722. Knowing, for example, that the vehicle will be sitting in a parking lot at the user's workplace for the next six (6) hours, an ECS may determine when would be most cost-effective and/or otherwise desirably during that charging window to provide the necessary electrical energy to the vehicle. In some embodiments, the ECS may determine that the window is too short to provide the necessary charge (*e.g.*, even if the entire charging window was to be utilized to charge the vehicle) and may notify (*e.g.*, via the interface 700) the user of the potential problem/deficiency. As shown in FIG. 7, the time to charge definition field 722 may provide the user with several options such as defining the time to charge in terms of number of parked hours expected and/or in terms of expected departure time.

[0064] In some embodiments, the "main" menu item 706 may comprise a monetary charge setting field 724. The monetary charge setting field 724, for example, may allow the user to specify whether the vehicle should be charged as much as possible during the charging window and/or otherwise charged regardless of energy rate costs, whether the vehicle should be charged "intelligently" during the charging window to minimize energy rate costs (*e.g.*, taking advantage of time-of-day energy rates), and/or whether the vehicle should be allowed to sell energy to make money for the user (*e.g.*, by providing energy generated by the vehicle and/or by depleting battery levels of the vehicle to some specified minimum amount).

[0065] In some embodiments, the "main" menu item 706 may comprise a factor of safety field 726 via which the user may set a factor of safety to be utilized in calculations regarding charging levels and schedules for the vehicle. The "main" menu item 706 may also or alternatively comprise contact information 728 for the user. The contact information 728 may be utilized by the interface 700 (and/or an ECS), for example, to send alerts and/or messages to the user and/or other designated parties. The "main" menu item 706 may comprise, for example, an

alerts field 730 that allows the use to specify various conditions and/or events that may trigger alerts and/or actions with respect to the vehicle. The user may turn "All Alerts On", for example, and/or may individually activate (i) charge thresholds (*e.g.*, minimum, maximum, and/or desired charge thresholds), (ii) rate thresholds (*e.g.*, minimum, maximum, and/or desired rate thresholds), (iii) internal temperature thresholds *e.g.*, minimum, maximum, and/or desired temperature thresholds), and/or (iv) vehicle diagnostics (*e.g.*, poor battery health, low oil, low tire pressure, alarm conditions, and/or maintenance reminders).

[0066] As shown in FIG. 7, the "main" menu item 706 may comprise a "pet in car" button 732. The "pet in car" button 732 may, for example, automatically set alerts and/or charge parameters to levels conducive to maintaining the comfort and safety of a pet left in a parked vehicle. In such a manner, for example, a user may safely leave a pet in a parked vehicle by establishing and/or setting charging parameters designed to keep the A/C on to maintain a cool vehicle and/or to keep the heat on to maintain a warm vehicle (*e.g.*, depending upon the relevant season and/or external weather conditions).

[0067] The interface 700 may receive indications of any or all desired parameters, options, and/or settings designated and/or defined by a user. Such information may then, for example, be stored in relation to an identifier of the vehicle and/or the user and may accordingly be utilized by an ECS (or a plurality of ECS facilities) to mange transmission of electrical energy to and/or from one or more desire vehicles.

VI. Processes

[0068] Various embodiments will now be described with references to methods, procedures, and/or processes associated with some embodiments. The methods, procedures, and/or processes described herein may generally be performed by any of the systems 100, 200, 300, 400, 500, 600 of FIG. 1, FIG. 2, FIG. 3, FIG. 4, FIG. 5, and/or FIG.6 and/or any of the many components and/or specific devices described herein. Other configurations of systems and devices may also or alternatively be utilized to perform the methods described herein without deviating from the scope of some embodiments. The procedures described herein do not necessarily imply a fixed order to the actions, and embodiments may be performed in any order that is practicable. Note that any of the methods described herein may be performed by hardware, software (including microcode), firmware, or any combination thereof. For example, a storage medium may store thereon instructions that when executed by a machine result in performance according to any of the embodiments described herein.

[0069] Referring to FIG. 8, for example, a flow diagram of a method 800 according to some embodiments is shown. The method 800 may be performed, for example, by an ECS and/or one or more components thereof as described herein. In some embodiments, the method 800 may comprise receiving (*e.g.*, from a vehicle sensor) information indicative of a presence of a vehicle in a parking space, at 802. The sensor may detect proximity of the vehicle via motion sensing, pressure sensing, light sensing, metal detecting, and/or wireless electronic

transmission sensing, for example. In some embodiments, the sensor may detect an actual physical coupling of the vehicle to a charge management device, may detect an electrical coupling of the vehicle to the charge management device, and/or may detect and/or analyze a positioning of the vehicle (*e.g.*, to determine whether the vehicle is properly positioned, oriented, and/or outfitted for charging services).

[0070] The method 800 may also or alternatively comprise receiving (*e.g.*, from a communication device of a vehicle) information indicative of an identifier of the vehicle, at 804. Vehicle identification information may be read and/or scanned from a camera image of the vehicle or a portion thereof (*e.g.*, a license plate and/or a VIN area), for example, and/or may be electrically determined such as by receiving signals from the vehicle. In some embodiments, charging preference and/or parameter information may also or alternatively be obtained. The vehicle identifier may be utilized to look-up the preference information, for example, and/or the preference information may be directly provided.

[0071] The method 800 may also or alternatively comprise determining, based at least on the information indicative of the identifier of the vehicle, a charging schedule for the vehicle, at 806. The preference information stored in relation to the vehicle identification information may, for example, be utilized to determine one or more rules and/or parameters that govern electrical transmissions to and/or from the vehicle (and/or a group or class of vehicles). In some embodiments, an ECS and/or control system may calculate, based on the charging parameters and/o preferences, how much energy the vehicle needs, how much energy is desired for the vehicle, when the needed and/or desired charge levels should be reached by, desired charging rate cost thresholds, etc.

[0072] The method 800 may also or alternatively comprise charging, in accordance with the charging schedule, the vehicle, at 808. One or more parking space charge devices may, for example, couple to provide (and/or receive) electrical energy from the vehicle in accordance with the determined schedule and/or regimen.

[0073] Referring to FIG. 9, a flow diagram of a method 900 according to some embodiments is shown. The method 900 may be performed, for example, by an ECS and/or one or more components thereof as described herein. In some embodiments, the method 900 may comprise determining an estimated amount of power required to charge a plurality of vehicles to desired levels, at 902. Utilizing information received and/or determined regarding the plurality of vehicles, for example, the ECS may compute an estimated amount of energy required to satisfy the desired charging regimens of the plurality of vehicles and/or an estimated amount of time required to achieve and/or implement such charging regimens.

[0074] The method 900 may also or alternatively comprise providing (*e.g.*, via a communication device), to a PSE, information indicative of the required power, at 904. The requirements and/or estimates determined and/or calculated at 902, for example, may be provided to the PSE.

[0075] The method 900 may also or alternatively comprise receiving (*e.g.*, via the communication device), from the PSE, information indicative of a time when a best available rate will be available to purchase the required power, at 906. The PSE may analyze the charging requirement information provided by the ECS and may provide

a suggested schedule to the ECS. In some embodiments, the information provided by the PSE may simply comprise rate and/or usage information, and the ECS may utilize such information to formulate and/or derive appropriate charging schedules.

[0076] The method 900 may also or alternatively comprise charging, at the indicated time and via a plurality of vehicle charging devices, the plurality of vehicles, at 908. The charging at 908 may, in some embodiments, be similar to the charging conducted at 808 of the method 800 herein.

[0077] Referring to FIG. 10, a flow diagram of a method 1000 according to some embodiments is shown. In some embodiments, the method 1000 may comprise determining an electrical load that requires electrical power, at 1002. A processor may determine an electrical draw on a circuit, for example, and/or may communicate with an entity associated with a load (*e.g.*, an ECS and/or an electric vehicle) to determine the requirements of the load.

[0078] The method 1000 may also or alternatively comprise determining a plurality of available sources of electrical power, at 1004. An ECS and/or "intelligent" electric switching device may, for example, be provided with a list of available power sources and/or may query to determine and/or discover available sources of power.

[0079] The method 1000 may also or alternatively comprise determining a characteristic of each of the plurality of available sources of power, at 1006. Various characteristics such as voltage, amperage, available quantity, consistency of generation, cost, generation type, and/or distance to the load (*e.g.*, either "as-the-crow-flies" or along one or more specific electrical traces and/or transmission paths) may, for example, be looked-up and/or determined. In some embodiments, information transmitted with electrical energy may provide some or all of the characteristic information.

[0080] The method 1000 may also or alternatively comprise selecting, based at least in part on the determined characteristics of the plurality of available sources of power, one or more of the available sources of power, at 1008. One or more stored rules may govern, for example, how a preferred power source is selected. In some embodiments, preferred power sources may comprise power sources that are located closer to the electrical load than other power sources. Such power sources may be more desirable, for example, due to the smaller amount of losses (and accordingly, increased efficiency) associated with delivering power from such sources to the load.

[0081] In some embodiments, the "greenness" and/or relative environmental friendliness of energy produced by a specific power source may be determined as a characteristic. Preferred power sources may then, for example, comprise renewable energy sources (*e.g.*, regardless of distance from the load), taking into account externalities that may otherwise not be taken into account when operating electrical switching equipment. In some embodiments, various characteristics may be scored and power sources may be assigned an overall point total. The power source listing may then be ranked, for example, and the highest ranking power source (or the highest ranking number of power sources; *e.g.*, the top three (3)) may be selected as the preferred power source(s).

[0082] The method 1000 may also or alternatively comprise activating at least one of the one or more electrical switches to cause electrical power from the selected one or more of the available sources of power to be provided to the electrical load, at 1010.

VII. Other Details of Embodiments

A. Wireless Charging Nodes

[0083] A parking space or other expanse suitable for maintaining an automobile in a generally stationary fashion is equipped with a means for wirelessly charging an automobile. Various methods for wirelessly transmitting an electrical charge are known including, but not limited to, resonant inductive coupling, and wireless microwave transmission. In addition, a company referred to as Powercast™ has demonstrated power transmission for quite a distance using RF (Radio Frequency) technology to beam EM waves in a direction to a transceiver which then converts the EM waves back to electricity. While described with reference to various technologies for enabling the wireless transmission of electrical energy, the exemplary embodiments described are not limited to any particular mode or process of such wireless transmission. Rather, the invention is broadly drawn to encompass any and all technologies that facilitate or otherwise enable the provision of electricity, electrical energy, and/or electrical power from a source to a receiver without a physical connection (*i.e.*, a wire or other physical electricity conducting medium) between the source and receiver. While many embodiments described herein are directed to wireless charging and/or energy transmission between vehicles and a power grid, some embodiments herein may be practiced utilizing plug-in and/or physical coupling to provide energy transmission. Load distribution, balancing, and/or pricing embodiments may, for example, be practiced in conjunction with any electrical transmission apparatus that is or becomes known or practicable (*e.g.*, not limited to wireless charging and/or transmissions).

[0084] When an automobile is positioned within a distance suitable for the provision of wireless electrical power, the provision of electrical power is enabled. In one embodiment, electrical power is wirelessly transmitted from a transmitter positioned underground or flush with the surface of the ground or pavement. In another embodiment, a transmitter is configured around the periphery of a space such that it is in sufficient proximity to a parked or stationary automobile to enable the transmission of electrical power.

[0085] The presence of an automobile may be sensed, as by a pressure sensor or via short range electronic communication such as Bluetooth or the like. In the latter instance, data may be transmitted between the automobile and a transceiver associated with the electrical transmitter. Such data may include, for example, a unique automobile identifier (*e.g.*, a Vehicle Identification Number (VIN)), an account identifier (*e.g.*, a credit card account, bank account, EZ-Pass® Account, Pay-Pal® Account, and/or electrical supplier account), and user selected parameters defining user charging preferences.

[0086] For example, upon pulling up to a space enabled/operable to provide electricity in a wireless fashion from one or more transmitters embedded flush with the surface of the pavement, a sensor receives an interrogation signal sent via Bluetooth® from the automobile sent as function of the automobile being put into park (and/or put into neutral, the parking brake being engaged, the engine being shut off, and/or the key being turned to a specific position – *e.g.*, position "IV" may comprise a position dedicated to indicating that the driver describes to activate one or more charging and/or power transmission sequences). The sensor receives an identifier of the automobile and interfaces with a central server to retrieve account information of an owner of the automobile. Likewise, such information can be stored in a memory device associated with the automobile and sent to the sensor. In addition, either sent from the automobile or retrieved from a server using the identifier, the sensor receives information regarding parameters defining how the automobile is to be charged. For example, such information might define a maximum rate willing to be paid for electricity. In addition, such information might specify a time by which the car is to be a certain percent charged. For example, a user may have specified that the car is not to be charged if the cost of electricity is over $.10/kWh. The user may also have specified that the automobile needs to be 80% charged at the end of eight hours. In some embodiments, the user may indicate a desired charging level (and/or a desired charging level may be automatically calculated) based on a desired distance of travel. In the case that the vehicle/charging facility is located 20 miles from the driver's home, for example, the driver (and/or the vehicle or charging station) may determine that the vehicle should be charged to have enough power to travel the 20 miles home (with or without a factor of safety and/or reserve travel capacity).

[0087] In the above example, the information may be entered into a central server for retrieval by the electrical charging system (ECS)(comprising the sensor and means for electrical charging), such as via a web page configuration page accessible by the driver or entered into the automobile such as via a dashboard based interface. Any other well known method incorporating a graphical user interface (GUI) may be employed to enter data into the automobile based memory or server. For example, an iPhone® interface may communicate via Bluetooth® with a memory device and processor resident in the automobile to make and/or change parameter selections. [Microsoft Sync…]

[0088] Once the information is received, the ECS operates to determine an appropriate charging schedule. For example, a driver parks his car in a space having an ECS. The driver knows that his car will sit in the space all work day, hence the chosen charging duration of eight hours. The ECS, perhaps relying on other retrieved information specifying the charging characteristics of the automobile, computes that it will take approximately three hours of charging to charge the automobile to a minimum of 80% charged. The ECS, via communication with the power supplier, determines that the present cost of electricity is $.12/kWh but will fall to $.09/kWh in two hours. The system therefore waits for two hours before charging the automobile for approximately three hours.

[0089] In addition to computing and implementing a charging regimen to meet the user specified parameters, the ECS can communicate with the user/driver to alert the driver to potential problems. For example, with

reference to the example above, the ECS may determine that the cost of electricity will be below $.10/kWh for only two of the next eight hours. The ECS may send a message to this effect to the user via a user specified node, such as a message on a dashboard display device, a message sent to a cell phone, an email account or the like. The user may be enabled to reply so as to modify or override a predetermined parameter selection. For example, the user may relax the maximum price for electricity attribute. In addition, the predefined parameter selections may include directions for actions to be taken when the predetermined charging regime cannot be met.

[0090] When charging is enabled, the system stores and makes accessible information regarding the operation of the ECS. For example, the user/driver can access real time (or near real time) charging information via a web page interface. For example, the user may enter a userid and password to view charging/account information. The viewable information may be maintained by the entity supplying the electrical power and/or by the proprietor of the ECS (which may be the same entity). The user may see that, at present, the ECS has scheduled charging to begin in two hours and proceed for the next three hours at a rate of $.085/kWh at which time the automobile will be 80% charged. At such time, the user may change selected parameters, such as the degree of desired charging and request an updated charging profile. For example, the user may change the requested charge percentage to be 100%. In response, ECS recomputes a charging regimen for display to the user/driver.

[0091] In the above described manner, the driver predefines a charging profile that is read and acted upon the ECS without required further input from the user/driver. By employing a central server, the charging regimen can be maintained as the user/driver leaves one ECS and parks at another ECS.

B. Load Balancing

[0092] As noted briefly above, when computing a charging regimen to match the user defined charging parameters, the ECS may communicate with a system or systems operated by the power supplying entity (PSE). In this manner, load balancing can be affected. For example, by communicating with the power supplier, the ECS may be able to obtain/"lock in" a desirable price for electricity at present or at a time in the future. For example, at peak times when electricity is most expensive, the PSE may inform the ECS that it will commit to providing three hours of electricity at $.085/kWh in two hours provided that it not provide any electricity for the next two hours. If thousands of cars are in communication with a PSE via an ECS and are somewhere within a charging regimen at any one time, such a shifting of the provision of electricity to a future time operates to balance the load at the PSE so as better obtain maximally efficient electricity generation.

[0093] Such load balancing may be implemented in real time. For example, if the PSE experiences an unexpected peak consumption requiring the inefficient firing up of additional electricity providing elements, the PSE can communicate with the ECSs to request a delay in providing electricity to automobiles. With reference to the above example, the ECS has determined that the automobile requires only three hours over the course of

the next eight hours to charge the automobile to the requested level. As a result, the ECS can delay providing electricity to the automobile for up to five hours as load balancing requires.

[0094] In one embodiment, electric cars are power generating entities. For example, the top and sides of an automobile may be fitted with solar panels. A typical automobile so outfitted may comprise approximately 60ft2 of solar panels. In addition, solar panels can be extended to incorporate more surface area, for example, when the automobile is substantially stationary. When parked outside, as in an outdoor parking lot with individual spaces configured to contain ECSs, a modest sized parking lot full of automobiles fitted with solar panels can generate a relatively large amount of electricity.

[0095] When fitted with solar panels, the ECS can operate to receive electricity from an automobile. For example, a user/driver may store amongst the preselected charging attributes that he will sell electricity generated by his automobile at a minimum price of $.11/kWh or at any price when the automobile does not need to be charged. For example, to shed some load, a PSE, currently charging $.14/kWh requests the ECSs to delay the charging of five hundred cars. The ECSs reply that five hundred cars can be delayed and, in addition, two hundred cars (perhaps some of which are included in the five hundred) have the capacity to sell electricity at various prices because they are either already charged or have specified a preference to sell electricity when possible (for the sake of simplicity, in the present example, they all agree to sell at $.11/kWh). The PSE instructs the ECSs to receive electricity from the two hundred automobiles while crediting the accounts of the users/drivers providing electricity.

[0096] In another embodiment, the automobiles using the ECS are not electric cars but have likewise been fitted with solar panels and equipments required to transmit electricity to an ECS. One problem with encouraging the widespread use of solar panels, such as on the roofs of existing houses, is the large cost of installation and maintenance. By installing solar panels at an automobile factory, economies of scale are introduced. In addition, the surfaces of an automobile are readily accessible for maintenance purposes. In addition, most automobiles spend extended periods of time exposed to sunlight during the daylight hours. If exposed while connected to an ECS, such automobiles provide a large, at present untapped, source of electricity. Furthermore, if such automobiles are provided with a battery to store power when away from an ECS, the stored power can be transferred to a PSE via an ECS when possible.

C. Energy Costs

[0097] Electrical energy costs are typically comprised of two components: (i) an electrical energy generation charge, and (ii) an electrical energy transmission charge. While electrical energy generation charges vary depending upon the supplier of electrical energy (*e.g.*, customers choosing to be supplied solely by renewable sources may pay more than customers receiving a mix of electrical energy), transmission charges are generally

fixed. In some embodiments, electrical energy transmission costs may vary depending upon various factors such as a distance of an electrical load from one or more electrical sources. Electric vehicles provided with electrical charging energy from an ECS, for example, may be charged one transmission rate for electrical energy that comes from the PSE (*e.g.*, "the grid"), while they may be charged a second (and likely lower) transmission rate for electrical energy supplied by other vehicles coupled to the ECS (*e.g.*, since there is a very short transmission distance and/or very small transmission losses). Similarly, an office building receiving energy from an ECS in an adjacent parking lot may pay little or no transmission costs while it may pay standard transmission costs when purchasing power from the grid/PSE.

[0098] In some embodiments, the actual distance between loads and sources may be utilized to calculate an appropriate transmission charge and/or to look-up an appropriate transmission charge in a pre-stored table and/or other data store. According to some embodiments, other factors such as total expected transmission losses, installation and/or maintenance costs of utilized transmission components, etc., may be utilized to determine an appropriate transmission rate or cost. While a load may pull energy from a nearby source, for example, a transmission means such as an undersea cable or microwave transmission tower may comprise relatively expensive infrastructure that causes the transmission rate to be higher than if the source pulled power from a further source from which power could be delivered via a much less expensive means (*e.g.*, a standard utility pole and power line configuration). In some embodiments, the cheapest available electrical transmission rate may be determined and/or the associated source(s) may be selected as the most appropriate source from which power should be supplied. According to some embodiments, the transmission route via which the smallest expected losses will occur may be determined and/or selected. In such a manner, for example, the power grid may be most efficiently managed to reduce transmission losses and maximize availability and usage of available power.

[0099] In some embodiments, the 'quality' of available electricity/energy from various sources may be compared and/or analyzed to determine from which available power source the power should be supplied. Some power sources and/or transmission means may provide power that is more consistent (*e.g.*, with respect to supplied frequency, voltage, and/or amperage) than power/energy provided from other sources. For critical loads such as power supply to hospitals, for example, the closest power source may comprise an ECS from an adjacent parking lot/parking garage, but that source may provide intermittent and/or otherwise lower-quality energy than, say, a large hydropower facility several miles (or more) away, that is estimated to be capable of consistently providing steady and/or high quality power for longer periods of time (*e.g.*, at night and/or during inclement weather). According to some embodiments, the 'quality' may also or alternatively be determined based on various externalities such as perceived environmental benefits and/or "greenness" of available power and/or power choices perceived to benefit the locality/local economy (*e.g.*, coal power may be preferred and/or selected for a source in a small town in western Pennsylvania, even though other sources may be cheaper, higher quality,

closer, and/or "greener", because the local and/or state or regional economy may be determined to be best served by purchasing relatively "local" products).

[0100] In some instances, electricity generated by solar panels attached to one or more automobiles in communication with one or more ECS may provide enough electricity to fully charge all of the automobiles in communication with the ECS. For example, the parking lot of a single office building may install an ECS that enables charging at a plurality of parking spaces. The automobiles utilizing the ECS may provide enough electricity, via solar panels, to meet all of the charging needs of the automobiles and may then divert additional electricity to the building.

[0101] Various exemplary embodiments described above allow for a multi-tiered approach to utilizing an ECS wherein additional benefits are realized with each additional tier of functionality. Such benefits include, but are not limited to, the following:

- First, enabling the charging of automobiles (EVS) and other vehicles in a variety of environments allows for the charging of vehicles in an efficient manner. For example, vehicles typically remain parked in a single place for long periods of time each day. The ECS and described methods for using the ECS permit a vehicle to recharge, generally, throughout the day at times most convenient to the owner/operator of the vehicle. In the instance that the charging is enabled via wireless charging, the additional effort required by the operator of the vehicle is negligible;
- Second, when the ECS is capable of communicating with the automobile, data may be exchanged to control the charging process. User defined preferences, stored at the automobile, on a server, or at any location accessible by the ECS can direct the charging process. In addition to enabling charging according to user defined preferences, the ECS may enable access by the user, such as via a web page, to view the charging status of the automobile in real time. By accessing profile information indicative of the individual performance of the automobile (such as prior charging times, battery life, battery performance, etc.), the ECS can customize the charging process as desired;
- Third, when the ECS is enabled to communicate with a power generating entity, load balancing is enabled. In the scenario where millions of automobiles utilize an ECS, thus substantially shifting energy consumption from petroleum based products in the form of gasoline, diesel fuel and the like to nuclear or coal generated electricity, exemplary embodiments enable load balancing to, for example, permit the efficient operation of such electricity generating facilities; and
- Fourth, when automobiles incorporate solar panels, electricity can be generated and added to the grid, or otherwise utilized to power entities in communication with the ECS, via the ECS.

VIII. Rules of Interpretation

[0102] Numerous embodiments are described in this disclosure, and are presented for illustrative purposes only. The described embodiments are not, and are not intended to be, limiting in any sense. The presently disclosed invention(s) are widely applicable to numerous embodiments, as is readily apparent from the disclosure. One of ordinary skill in the art will recognize that the disclosed invention(s) may be practiced with various modifications and alterations, such as structural, logical, software, and electrical modifications. Although particular features of the disclosed invention(s) may be described with reference to one or more particular embodiments and/or drawings, it should be understood that such features are not limited to usage in the one or more particular embodiments or drawings with reference to which they are described, unless expressly specified otherwise.

[0103] The present disclosure is neither a literal description of all embodiments nor a listing of features of the invention that must be present in all embodiments.

[0104] Neither the Title (set forth at the beginning of the first page of this disclosure) nor the Abstract (set forth at the end of this disclosure) is to be taken as limiting in any way as the scope of the disclosed invention(s).

[0105] The term "product" means any machine, manufacture and/or composition of matter as contemplated by 35 U.S.C. §101, unless expressly specified otherwise.

[0106] The terms "an embodiment", "embodiment", "embodiments", "the embodiment", "the embodiments", "one or more embodiments", "some embodiments", "one embodiment" and the like mean "one or more (but not all) disclosed embodiments", unless expressly specified otherwise.

[0107] The terms “the invention” and “the present invention” and the like mean “one or more embodiments of the present invention.”

[0108] A reference to "another embodiment" in describing an embodiment does not imply that the referenced embodiment is mutually exclusive with another embodiment (*e.g.*, an embodiment described before the referenced embodiment), unless expressly specified otherwise.

[0109] The terms "including", "comprising" and variations thereof mean "including but not limited to", unless expressly specified otherwise.

[0110] The terms "a", "an" and "the" mean "one or more", unless expressly specified otherwise.

[0111] The term "plurality" means "two or more", unless expressly specified otherwise.

[0112] The term "herein" means "in the present disclosure, including anything which may be incorporated by reference", unless expressly specified otherwise.

[0113] The phrase "at least one of", when such phrase modifies a plurality of things (such as an enumerated list of things) means any combination of one or more of those things, unless expressly specified otherwise. For example, the phrase at least one of a widget, a car and a wheel means either (i) a widget, (ii) a car, (iii) a wheel, (iv) a widget and a car, (v) a widget and a wheel, (vi) a car and a wheel, or (vii) a widget, a car and a wheel.

[0114] The phrase "based on" does not mean "based only on", unless expressly specified otherwise. In other words, the phrase "based on" describes both "based only on" and "based at least on".

[0115] Where a limitation of a first claim would cover one of a feature as well as more than one of a feature (*e.g.*, a limitation such as "at least one widget" covers one widget as well as more than one widget), and where in a second claim that depends on the first claim, the second claim uses a definite article "the" to refer to the limitation (*e.g.*, "the widget"), this does not imply that the first claim covers only one of the feature, and this does not imply that the second claim covers only one of the feature (*e.g.*, "the widget" can cover both one widget and more than one widget).

[0116] Each process (whether called a method, algorithm or otherwise) inherently includes one or more steps, and therefore all references to a "step" or "steps" of a process have an inherent antecedent basis in the mere recitation of the term 'process' or a like term. Accordingly, any reference in a claim to a 'step' or 'steps' of a process has sufficient antecedent basis.

[0117] When an ordinal number (such as "first", "second", "third" and so on) is used as an adjective before a term, that ordinal number is used (unless expressly specified otherwise) merely to indicate a particular feature, such as to distinguish that particular feature from another feature that is described by the same term or by a similar term. For example, a "first widget" may be so named merely to distinguish it from, *e.g.*, a "second widget". Thus, the mere usage of the ordinal numbers "first" and "second" before the term "widget" does not indicate any other relationship between the two widgets, and likewise does not indicate any other characteristics of either or both widgets. For example, the mere usage of the ordinal numbers "first" and "second" before the term "widget" (1) does not indicate that either widget comes before or after any other in order or location; (2) does not indicate that either widget occurs or acts before or after any other in time; and (3) does not indicate that either widget ranks above or below any other, as in importance or quality. In addition, the mere usage of ordinal numbers does not define a numerical limit to the features identified with the ordinal numbers. For example, the mere usage of the ordinal numbers "first" and "second" before the term "widget" does not indicate that there must be no more than two widgets.

[0118] When a single device or article is described herein, more than one device or article (whether or not they cooperate) may alternatively be used in place of the single device or article that is described. Accordingly, the functionality that is described as being possessed by a device may alternatively be possessed by more than one device or article (whether or not they cooperate).

[0119] Similarly, where more than one device or article is described herein (whether or not they cooperate), a single device or article may alternatively be used in place of the more than one device or article that is described. For example, a plurality of computer-based devices may be substituted with a single computer-based device. Accordingly, the various functionality that is described as being possessed by more than one device or article may alternatively be possessed by a single device or article.

[0120] The functionality and/or the features of a single device that is described may be alternatively embodied by one or more other devices that are described but are not explicitly described as having such functionality and/or features. Thus, other embodiments need not include the described device itself, but rather can include the one or more other devices which would, in those other embodiments, have such functionality/features.

[0121] Devices that are in communication with each other need not be in continuous communication with each other, unless expressly specified otherwise. On the contrary, such devices need only transmit to each other as necessary or desirable, and may actually refrain from exchanging data most of the time. For example, a machine in communication with another machine via the Internet may not transmit data to the other machine for weeks at a time. In addition, devices that are in communication with each other may communicate directly or indirectly through one or more intermediaries.

[0122] A description of an embodiment with several components or features does not imply that all or even any of such components and/or features are required. On the contrary, a variety of optional components are described to illustrate the wide variety of possible embodiments of the present invention(s). Unless otherwise specified explicitly, no component and/or feature is essential or required.

[0123] Further, although process steps, algorithms or the like may be described in a sequential order, such processes may be configured to work in different orders. In other words, any sequence or order of steps that may be explicitly described does not necessarily indicate a requirement that the steps be performed in that order. The steps of processes described herein may be performed in any order practical. Further, some steps may be performed simultaneously despite being described or implied as occurring non-simultaneously (*e.g.*, because one step is described after the other step). Moreover, the illustration of a process by its depiction in a drawing does not imply that the illustrated process is exclusive of other variations and modifications thereto, does not imply that the illustrated process or any of its steps are necessary to the invention, and does not imply that the illustrated process is preferred.

[0124] Although a process may be described as including a plurality of steps, that does not indicate that all or even any of the steps are essential or required. Various other embodiments within the scope of the described invention(s) include other processes that omit some or all of the described steps. Unless otherwise specified explicitly, no step is essential or required.

[0125] Although a product may be described as including a plurality of components, aspects, qualities, characteristics and/or features, that does not indicate that all of the plurality are essential or required. Various other embodiments within the scope of the described invention(s) include other products that omit some or all of the described plurality.

[0126] An enumerated list of items (which may or may not be numbered) does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. Likewise, an enumerated list of items (which may or may not be numbered) does not imply that any or all of the items are comprehensive of any category,

unless expressly specified otherwise. For example, the enumerated list "a computer, a laptop, a PDA" does not imply that any or all of the three items of that list are mutually exclusive and does not imply that any or all of the three items of that list are comprehensive of any category.

[0127] Headings of sections provided in this disclosure are for convenience only, and are not to be taken as limiting the disclosure in any way.

[0128] "Determining" something can be performed in a variety of manners and therefore the term "determining" (and like terms) includes calculating, computing, deriving, looking up (*e.g.*, in a table, database or data structure), ascertaining, recognizing, and the like.

[0129] A "display" as that term is used herein is an area that conveys information to a viewer. The information may be dynamic, in which case, an LCD, LED, CRT, Digital Light Processing (DLP), rear projection, front projection, or the like may be used to form the display. The aspect ratio of the display may be 4:3, 16:9, or the like. Furthermore, the resolution of the display may be any appropriate resolution such as 480i, 480p, 720p, 1080i, 1080p or the like. The format of information sent to the display may be any appropriate format such as Standard Definition TeleVision (SDTV), Enhanced Definition TV (EDTV), High Definition TV (HDTV), or the like. The information may likewise be static, in which case, painted glass may be used to form the display. Note that static information may be presented on a display capable of displaying dynamic information if desired. Some displays may be interactive and may include touch screen features or associated keypads as is well understood.

[0130] A control system, as that term is used herein, may be a computer processor coupled with an operating system, device drivers, and appropriate programs (collectively "software") with instructions to provide the functionality described for the control system. The software is stored in an associated memory device (sometimes referred to as a computer readable medium). While it is contemplated that an appropriately programmed general purpose computer or computing device may be used, it is also contemplated that hard-wired circuitry or custom hardware (*e.g.*, an application specific integrated circuit (ASIC)) may be used in place of, or in combination with, software instructions for implementation of the processes of various embodiments. Thus, embodiments are not limited to any specific combination of hardware and software.

[0131] A "processor" means any one or more microprocessors, Central Processing Unit (CPU) devices, computing devices, microcontrollers, digital signal processors, or like devices. Exemplary processors are the INTEL PENTIUM or AMD ATHLON processors.

[0132] The term "computer-readable medium" refers to any medium that participates in providing data (*e.g.*, instructions) that may be read by a computer, a processor or a like device. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media include, for example, optical or magnetic disks and other persistent memory. Volatile media include DRAM, which typically constitutes the main memory. Transmission media include coaxial cables, copper wire and fiber optics, including the wires that comprise a system bus coupled to the processor. Transmission media may include or

convey acoustic waves, light waves and electromagnetic emissions, such as those generated during RF and IR data communications. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, Digital Video Disc (DVD), any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, an EPROM, a FLASH-EEPROM, a USB memory stick, a dongle, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read. The terms "computer-readable memory" and/or "tangible media" specifically exclude signals, waves, and wave forms or other intangible media that may nevertheless be readable by a computer.

[0133] Various forms of computer readable media may be involved in carrying sequences of instructions to a processor. For example, sequences of instruction (i) may be delivered from RAM to a processor, (ii) may be carried over a wireless transmission medium, and/or (iii) may be formatted according to numerous formats, standards or protocols. For a more exhaustive list of protocols, the term "network" is defined below and includes many exemplary protocols that are also applicable here.

[0134] It will be readily apparent that the various methods and algorithms described herein may be implemented by a control system and/or the instructions of the software may be designed to carry out the processes of the present invention.

[0135] Where databases are described, it will be understood by one of ordinary skill in the art that (i) alternative database structures to those described may be readily employed, and (ii) other memory structures besides databases may be readily employed. Any illustrations or descriptions of any sample databases presented herein are illustrative arrangements for stored representations of information. Any number of other arrangements may be employed besides those suggested by, *e.g.*, tables illustrated in drawings or elsewhere. Similarly, any illustrated entries of the databases represent exemplary information only; one of ordinary skill in the art will understand that the number and content of the entries can be different from those described herein. Further, despite any depiction of the databases as tables, other formats (including relational databases, object-based models, hierarchical electronic file structures, and/or distributed databases) could be used to store and manipulate the data types described herein. Likewise, object methods or behaviors of a database can be used to implement various processes, such as those described herein. In addition, the databases may, in a known manner, be stored locally or remotely from a device that accesses data in such a database. Furthermore, while unified databases may be contemplated, it is also possible that the databases may be distributed and/or duplicated amongst a variety of devices.

[0136] As used herein a "network" is an environment wherein one or more computing devices may communicate with one another. Such devices may communicate directly or indirectly, via a wired or wireless medium such as the Internet, LAN, WAN or Ethernet (or IEEE 802.3), Token Ring, or via any appropriate communications means or combination of communications means. Exemplary protocols include but are not limited to: Bluetooth™, Time

Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Global System for Mobile communications (GSM), Enhanced Data rates for GSM Evolution (EDGE), General Packet Radio Service (GPRS), Wideband CDMA (WCDMA), Advanced Mobile Phone System (AMPS), Digital AMPS (D-AMPS), IEEE 802.11 (WI-FI), IEEE 802.3, SAP, SAS™ by IGT, OASIS™ by Aristocrat Technologies, SDS by Bally Gaming and Systems, ATP, TCP/IP, GDS published by the Gaming Standards Association of Fremont CA, the best of breed (BOB), system to system (S2S), or the like. Note that if video signals or large files are being sent over the network, a broadband network may be used to alleviate delays associated with the transfer of such large files, however, such is not strictly required. Each of the devices is adapted to communicate on such a communication means. Any number and type of machines may be in communication via the network. Where the network is the Internet, communications over the Internet may be through a website maintained by a computer on a remote server or over an online data network including commercial online service providers, bulletin board systems, and the like. In yet other embodiments, the devices may communicate with one another over RF, cable TV, satellite links, and the like. Where appropriate encryption or other security measures such as logins and passwords may be provided to protect proprietary or confidential information.

[0137] Communication among computers and devices may be encrypted to insure privacy and prevent fraud in any of a variety of ways well known in the art. Appropriate cryptographic protocols for bolstering system security are described in Schneier, APPLIED CRYPTOGRAPHY, PROTOCOLS, ALGORITHMS, AND SOURCE CODE IN C, John Wiley & Sons, Inc. 2d ed., 1996, which is incorporated by reference in its entirety.

[0138] The term "whereby" is used herein only to precede a clause or other set of words that express only the intended result, objective or consequence of something that is previously and explicitly recited. Thus, when the term "whereby" is used in a claim, the clause or other words that the term "whereby" modifies do not establish specific further limitations of the claim or otherwise restricts the meaning or scope of the claim.

[0139] It will be readily apparent that the various methods and algorithms described herein may be implemented by, *e.g.*, appropriately programmed general purpose computers and computing devices. Typically a processor (*e.g.*, one or more microprocessors) will receive instructions from a memory or like device, and execute those instructions, thereby performing one or more processes defined by those instructions. Further, programs that implement such methods and algorithms may be stored and transmitted using a variety of media (*e.g.*, computer readable media) in a number of manners. In some embodiments, hard-wired circuitry or custom hardware may be used in place of, or in combination with, software instructions for implementation of the processes of various embodiments. Thus, embodiments are not limited to any specific combination of hardware and software.

[0140] The present disclosure provides, to one of ordinary skill in the art, an enabling description of several embodiments and/or inventions. Some of these embodiments and/or inventions may not be claimed in the present application, but may nevertheless be claimed in one or more continuing applications that claim the benefit of

priority of the present application. Applicant intends to file additional applications to pursue patents for subject matter that has been disclosed and enabled but not claimed in the present application.

What is claimed is:

1. An electrical charging system, comprising:

one or more processing devices; and

a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:

receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle via a Graphical User Interface (GUI) forming a part of the electric vehicle and adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising:

(i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle;

(ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and

(iii) a third portion comprising a slider by which an amount of charge may be specified;

displaying a charging status of the electric vehicle via the GUI; and

increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;

wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge.

2. The electrical charging system of claim 1, wherein executing the instructions by the one or more processing devices further results in:

determining, based at least on the desired charge level, a charging schedule for the electric vehicle.

3. The electrical charging system of claim 2, wherein the increasing of the level of charge is performed in accordance with the charging schedule.

4. The electrical charging system of claim 1, wherein the first portion operates to output the amount of charge residing in the battery, the second portion operates to output the uncharged capacity of the battery and the third portion is an input GUI element.

5. The electrical charging system of claim 1, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises:

transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle.

6. An electrical charging system, comprising:

one or more processing devices; and

a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:

receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle via a Graphical User Interface (GUI) forming a part of the electric vehicle and adapted to display a unitary vehicle charge indicator comprising:

(i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle;

(ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and

(iii) a third portion comprising a slider by which an amount of charge may be specified;

displaying a charging status of the electric vehicle via the GUI; and

increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;

wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge.

7. The electrical charging system of claim 6, wherein executing the instructions by the one or more processing devices further results in:

determining, based at least on desired charge level, a charging schedule for the electric vehicle.

8. The electrical charging system of claim 7, wherein the increasing of the level of charge is performed in accordance with the charging schedule.

9. The electrical charging system of claim 6, wherein the first portion is an output GUI element, the second portion is an output GUI element and the third portion is an input GUI element.

10. The electrical charging system of claim 6, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises:

transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle.

11. An electrical charging system, comprising:

one or more processing devices; and

a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:

receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle via a Graphical User Interface (GUI) adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising:

(i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle;

(ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and

(iii) a third portion comprising a slider by which an amount of charge may be specified;

displaying a charging status of the electric vehicle via the GUI; and

increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;

wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge.

12. The electrical charging system of claim 11, wherein executing the instructions by the one or more processing devices further results in:

determining, based at least on the desired charge level, a charging schedule for the electric vehicle.

13. The electrical charging system of claim 12, wherein the increasing of the level of charge is performed in accordance with the charging schedule.

14. The electrical charging system of claim 11, wherein the first portion operates to output the amount of charge residing in the battery, the second portion operates to output the uncharged capacity of the battery and the third portion is an input GUI element.

15. The electrical charging system of claim 11, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises:

transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle.

16. The electrical charging system of claim 11, wherein the GUI is forms a part of a mobile display device.

17. The electrical charging system of claim 16, wherein the mobile display device is a smartphone.

ABSTRACT

Systems and methods for charging electric vehicles utilizing Graphical User Interface (GUI) elements.

COMBINED ASSIGNMENT OF RIGHTS, TITLE, AND INTEREST IN INVENTION AND DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Attorney Docket No.: TL01-001-02-01

THIS AGREEMENT is made as of the last date of execution hereinafter, by and between:
Inventor(s) (Assignor(s)):**

#	Name	Address
1	Jeffrey R. Ambroziak	563 Lake Drive, Guilford, CT 06347
2	Carson C.K. Fincham	125 Florida Road, Ridgefield, CT 06877
3	--	--
4	--	--
5	--	--
6	--	--
7	--	--
8	--	--
9	--	--
10	--	--

and:

**any records denoted with "--" or "N/A", or otherwise not indicating an inventor name, are intentionally not utilized.

Assignee:

Name	Address
Charge Fusion Technologies, LLC	125 Florida Road Ridgefield, CT 06877 US

(collectively, the "Parties").

WHEREAS, Assignor(s) has invented certain new and useful improvements as described by:
Title of Invention:

SYSTEMS AND METHODS FOR CHARGING ELECTRIC VEHICLES UTILIZING A TOUCH-SENSITIVE INTERFACE

and as described in: *(the "Application(s)" - check and provide details for all that apply)*

- ☑ United States Non-Provisional Patent Application Serial No(s).: 15/848,017
- ☐ United States Provisional Patent Application Serial No(s).:
- ☐ United States Patent No(s).:
- ☐ International Patent/Patent Application Serial No(s).:

(the "Invention"); and

WHEREAS, the undersigned Inventor(s) hereby declares, with respect to the Application(s), that:

(1) the Application(s) was made or authorized to be made by Inventor(s);

(2) Inventor(s) believes, with respect to any claims in the Application(s), that Inventor(s) is the original inventor or an original joint inventor of an invention claimed in the Application(s);

(3) Inventor(s) has reviewed and understands the contents of the Application(s), including any claims thereof;

(4) Inventor(s) acknowledges the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application; and

(5) all statements made herein Inventor(s)' own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment of not more than five (5) years, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the above-identified application or any patent issued thereon; and

WHEREAS, Assignee is desirous of acquiring the entire right, title and interest in and to the Invention as set forth herein, and Assignor(s) wishes to transfer all such right, title, and interest in the Invention to Assignee;

NOW THEREFORE, in consideration of any promises, covenants, warranties, and other good and valuable consideration set forth herein or otherwise, receipt whereof being hereby acknowledged, the Parties agree as follows:

1. **Assignment.** Assignor(s) hereby assigns to Assignee, and its successors, representatives and assigns, the following Rights, Title, and Interests, including all rights to and in any and all income, royalties, damages and payments, injunctive and/or equitable relief, now or hereinafter due or payable with respect to: *(check all that apply)*

   ☑ United States of America Rights, Title, and Interest in the Invention, including any and all existing and future patent applications, continuation, divisional, PCT U.S. National stage, and/or reissue applications, and/or reexaminations thereof, and any and all Letters Patent issued there from, and any and all priority rights and/or other benefits accruing or to accrue with respect to the filing of patent applications or securing of patents in the United States and Territories thereof. Assignor(s) also hereby authorizes and requests that the Commissioner of the United States Patent and Trademark Office issue any United States Letters Patent that may issue for the Invention to the Assignee, as assignee of the whole right, title, and interest thereto.

   ☑ Non-U.S. Rights, Title, and Interest in the Invention, including any and all PCT patent applications, PCT Non-U.S. National stage applications, and any and all International Applications, Convention rights, and any and all priority rights and/or other benefits accruing or to accrue with respect to the filing of patent applications or securing of patents in Non-U.S. jurisdictions. Assignor(s) also authorizes the Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent or similar legal protection (such as certificates of invention or utility models or other governmental grants or issuances), in its own name if desired, in any and all Non-U.S. jurisdictions.

   ☐ Other Rights (*please specify*):

2. **Assignor(s) Representations and Warranties.** Assignor(s) hereby represents and warrants that Assignor(s) has the legal right and authority to execute this Agreement and to validly assign the entire right, clear title, and interest in the Invention to Assignee. Assignor(s) further represents and warrants that Assignor(s) has not and shall not execute any writing or do any act whatsoever conflicting with this Agreement. Assignor(s) further warrants that the Assignor(s), the Assignor(s)'s executors or administrators, will at any time upon request, without additional consideration, but at the expense of the Assignee, its successors and assigns, execute, in a timely manner, such additional writings and do such additional acts as the Assignee, its successors and assigns, may deem desirable to perfect its enjoyment of this grant, and render all assistance in making application for and obtaining, maintaining, and enforcing any Patents or similar legal protection on the Invention in any and all jurisdictions as indicated herein.

3. **Counterparts.** This Agreement may be executed in multiple counterparts, each of which shall constitute an original and all of which, when taken together, shall constitute the single Agreement.

4. **Severability.** If any part of this Agreement shall be held unenforceable for any reason, the remainder of the Agreement shall continue in full force and effect. If any provision of this Agreement is deemed unenforceable by any court of competent jurisdiction, and if limiting such provision would make the provision valid, then such provision shall be deemed to be construed as so limited.

Signature Page(s) follows.

IN WITNESS THEREOF, the Parties have caused this Agreement to be executed as of the last day, month, and year indicated below.

Inventor(s) (Assignor(s)):

Inventor #	Name	Date	Signature
1	Jeffrey R. Ambroziak	19 Dec 17	/Jeffrey R. Ambroziak/
2	Carson C.K. Fincham	12/19/17	
3	---		
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Assignee:

Name and Title	Date	Signature
Carson C.K. Fincham, Member	12/19/17	

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
18/340,781	06/23/2023		664	CF01-001-02-07	17	3

CONFIRMATION NO. 8229

FILING RECEIPT

89411
RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

Date Mailed: 07/27/2023

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Jeffrey R. Ambroziak, Guilford, CT;
Carson C.K. Fincham, Ridgefield, CT;

Applicant(s)

Charge Fusion Technologies, LLC, Ridgefield, CT;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 17/826,229 05/27/2022
which is a CON of 17/306,776 05/03/2021 PAT 11,631,987
which is a CON of 17/012,325 09/04/2020 PAT 10,998,753
which is a CON of 15/848,017 12/20/2017 PAT 10,819,135
which is a CON of 12/502,041 07/13/2009 PAT 9,853,488
which claims benefit of 61/134,646 07/11/2008

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 07/25/2023
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 18/340,781**
Projected Publication Date: 11/02/2023
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 18/340,781

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	64		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	280		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	320		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	17 minus 20 =	* 0	x =	0	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x =	0			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	664		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	18340781
Filing Date	2023-06-23
First Named Inventor	Jeffrey R. Ambroziak
Art Unit	3649
Examiner Name	TBD
Attorney Docket Number	CF01-001-02-07

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18340781
	Filing Date	2023-06-23
	First Named Inventor	Jeffrey R. Ambroziak
	Art Unit	3649
	Examiner Name	TBD
	Attorney Docket Number	CF01-001-02-07

	1	Office Action dated August 5, 2022 for US App. No. 17/829,412 (pages1-4)	☐
	2	Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated August 12, 2013; 15 pps.	☐
	3	Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated December 15,2011; 9 pps.	☐
	4	Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated January 7, 2013; 17 pps.	☐
	5	Office Action for Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated January 17, 2020; 21 pps.	☐
	6	Website: The Tesla Roadster (first generation) Drive Zero Car Guide—Drive Zero “https://www.drivezero.com.au/cars/tesla/tesla-car-guides/tesla-roadster-1-guide/” download date Oct. 21, 2019; 21 pps.	☐
	7	Wikipedia (R) download for article title “Better Place”, http://en.wikipedia.org/wiki/Better_Place, dated Dec. 12, 2013; 14 pps.	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	18340781
	Filing Date	2023-06-23
	First Named Inventor	Jeffrey R. Ambroziak
	Art Unit	3649
	Examiner Name	TBD
	Attorney Docket Number	CF01-001-02-07

CERTIFICATION STATEMENT

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☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Carson C.K. Fincham, Reg. No. 54,096/	Date (YYYY-MM-DD)	2023-08-04
Name/Print	Carson C.K. Fincham	Registration Number	54096

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Espacenet

Bibliographic data: WO2008059846 (A1) — 2008-05-22

ELECTRICITY STORAGE DEVICE

Inventor(s): HOJO NOBUHIKO; OHTSUKA YU; WATANABE SHOICHIRO; HONDA KAZUYOSHI ± (HOJO, NOBUHIKO, ; OHTSUKA, YU, ; WATANABE, SHOICHIRO, ; HONDA, KAZUYOSHI)

Applicant(s): MATSUSHITA ELECTRIC IND CO LTD [JP]; HOJO NOBUHIKO; OHTSUKA YU; WATANABE SHOICHIRO; HONDA KAZUYOSHI ± (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD, ; HOJO, NOBUHIKO, ; OHTSUKA, YU, ; WATANABE, SHOICHIRO, ; HONDA, KAZUYOSHI)

Classification:

- **international:** ***H01G11/02; H01G11/06; H01G11/22; H01G11/30; H01G11/42; H01G11/46; H01G11/48; H01G11/70; H01M10/05; H01M10/0525; H01M10/0566; H01M10/058; H01M10/36; H01M4/13; H01M4/134; H01M4/136; H01M4/137; H01M4/139; H01M4/1395; H01M4/1397; H01M4/1399; H01M4/38; H01M4/48; H01M4/58; H01M4/583; H01M4/587; H01M4/60; H01M4/66; H01M4/70; H01M4/74; H01M4/80;*** *H01M4/133; H01M4/1393*
- **cooperative:** **H01G11/06 (EP, CN, US); H01G11/26 (EP, US); H01G11/28 (EP, US); H01G11/30 (CN); H01G11/32 (EP, US); H01G11/50 (EP, US); H01G11/70 (CN); H01M10/05 (CN); H01M10/0525 (EP, US); H01M4/134 (EP, US); H01M4/1395 (EP, US); H01M4/38 (CN); H01M4/382 (EP, US); H01M4/386 (EP, CN, US); H01M4/387 (EP, CN, US); H01M4/48 (CN); H01M4/483 (EP, US); H01M4/58 (CN); H01M4/587 (EP, US); H01M4/60 (CN); H01M4/64 (EP, US); H01M4/70 (EP, CN, US);** H01M2004/021 (EP, US); H01M2010/4292 (EP, US); H01M4/133 (EP, US); H01M4/1393 (EP, US); H01M4/38 (EP, US); Y02E60/10 (EP); Y02E60/13 (US); Y02P70/50 (EP); Y02T10/70 (EP, US)

Application number: WO2007JP72027 20071113 Global Dossier

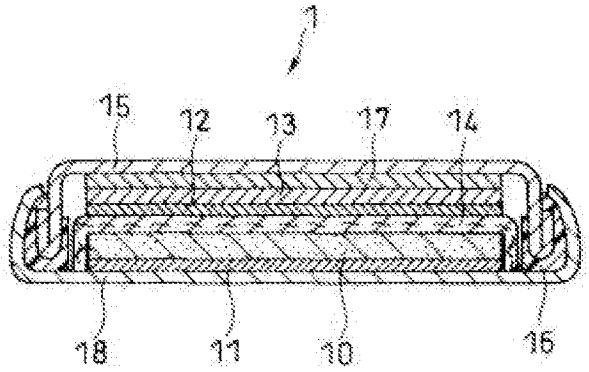
Priority number(s): JP20060310003 20061116 ; JP20070026245 20070206 ; JP20070043154 20070223 ; JP20070066385 20070315 ; JP20070123275 20070508

Also published as: AT516610 (T) CN105098223 (A) EP2113960 (A1) EP2113960 (A4) EP2113960 (B1) more

Abstract of WO2008059846 (A1)

Disclosed is an electricity storage device which can be charged/discharged at high speed and have high output, high capacity and excellent repeating characteristics.

characteristics, although it uses a non-carbon material as a negative electrode active material. Specifically disclosed is an electricity storage device comprising a positive electrode collector, a positive electrode arranged on the positive electrode collector and containing a positive electrode active material which can reversibly absorb/desorb at least anions, a negative electrode collector, and a negative electrode arranged on the negative electrode collector and composed ofa negative electrode active material which can substantially absorb/desorb lithium ions reversibly. The negative electrode active material is composed of at least one substance selected from the group consisting of silicon, silicon-containing alloys, silicon compounds, tin, tin-containing alloys and tin compounds; and the negative electrode is formed as a thin film having a thickness of not more than 10 μm.



(12) 特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

(43) 国際公開日
2008 年5 月22 日 (22.05.2008)

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H01G 9/058 (2006.01) *H01M 4/58* (2006.01)
H01M 4/02 (2006.01) *H01M 4/60* (2006.01)
H01M 4/38 (2006.01) *H01M 4/70* (2006.01)

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特願2007-043154 2007 年2 月23 日 (23.02.2007) JP
特願2007-066385 2007 年3 月15 日 (15.03.2007) JP
特願2007-123275 2007 年5 月8 日 (08.05.2007) JP

(71) 出願人 (米国を除く全ての指定国について): 松下電器産業株式会社 (Matsushita Electric Industrial Co., Ltd.) [JP/JP]; 〒5718501 大阪府門真市大字門真１００６番地 Osaka (JP).

(72) 発明者; および
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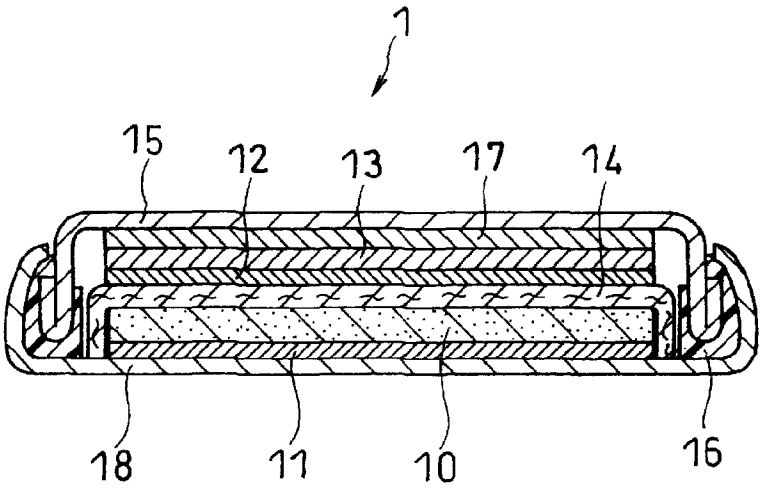
(74) 代理人: 石井 和郎, 外(ISHII, Kazuo et al.); 〒5410041 大阪府大阪市中央区北浜２丁目３番６号 北浜山本ビル Osaka (JP).

(81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,

[続葉有]

(54) Title: ELECTRICITY STORAGE DEVICE

(54) 発明の名称: 蓄電デバイス



(57) Abstract: Disclosed is an electricity storage device which can be charged/discharged at high speed and have high output, high capacity and excellent repeating charge/discharge characteristics, although it uses a non-carbon material as a negative electrode active material. Specifically disclosed is an electricity storage device comprising a positive electrode collector, a positive electrode arranged on the positive electrode collector and containing a positive electrode active material which can reversibly absorb/desorb at least anions, a negative electrode collector, and a negative electrode arranged on the negative electrode collector and composed ofa negative electrode active material which can substantially absorb/desorb lithium ions reversibly. The negative electrode active material is composed of at least one substance selected from the group consisting of silicon, silicon-containing alloys, silicon compounds, tin, tin-containing alloys and tin compounds; and the negative electrode is formed as a thin film having a thickness of not more than 10 μm.

(57) 要約: 本発明は、負極活物質として非炭素材料を用いるにもかかわらず、高速での充放電が可能であり、高出力、高容量、および優れた繰り返し充放電寿命特性を有する蓄電デバイスを提供することを目的とする。本発明は、正極集電体と、正極集電体上に配された、少なくともアニオンを可逆的に吸脱着可能な正極活物質を含む正極と、負極集電体と、負極集電体上に配された、実質的に、リチウムイオンを可逆的に吸蔵および放出可能な負極活物質からなる負極とを備え、負極活物質は、珪素、珪素含有合金、珪素化合物、錫、錫含有合金、および錫化合物からなる群より選ばれる少なくとも１つであり、負極は厚み１０μｍ以下の薄膜である蓄電デバイスに関する。

WO 2008/059846 A1

OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:
— 国際調査報告書

明 細 書

蓄電デバイス

技術分野

[0001] 本発明は、高出力および高容量を有し、繰り返し充放電寿命特性に優れた蓄電デバイスに関する。

背景技術

[0002] 従来から、充放電可能な蓄電デバイスは、ガソリンと電気という2つのエネルギーを用いて駆動するハイブリッド自動車、各種電子機器、特に移動体通信機器、携帯電子機器などの電源、無停電電源などに用いられている。最近におけるハイブリッド自動車や電子機器の普及に伴い、蓄電デバイスに対する高性能化への要求が非常に高まっている。このような要求に対して、蓄電デバイスの1種である電気二重層キャパシタに関する研究開発が盛んに行われている。電気二重層キャパシタは、高出力でかつ繰り返し充放電寿命特性に優れるという特徴を有し、主に高出力用途への応用が期待されるが、二次電池に比べて、容量すなわちエネルギー密度が低い。

[0003] 電気二重層キャパシタの高容量化には、たとえば、電気二重層キャパシタの正極活物質とリチウムイオン電池の負極活物質とを選定し、正極活物質および負極活物質自体の最適化、組み合わせの最適化などについて、種々検討されている。負極活物質としては、たとえば、グラファイト、ポリアセンなどの結晶質または非晶質の炭素材料が検討されている。これらの炭素材料は、充放電によりリチウムイオンを可逆的に吸蔵・放出し得る材料である。これらの炭素材料の製造法、活性炭などの電気二重層キャパシタの正極活物質とこれらの炭素材料を含む負極とを組み合わせた蓄電デバイスなどが数多く提案されている(たとえば、特許文献1および特許文献2参照)。

[0004] また、炭素材料よりも容量密度の大きい負極活物質を用いることによって、蓄電デバイスを高容量化しようとする試みがなされている。このような負極活物質としては、炭素材料を改質してなる負極活物質、炭素材料以外の負極活物質などが挙げられる。炭素材料を改質してなる負極活物質としては、「黒鉛を除く光学的異方性炭素質

物を賦活処理した負極活物質、それらの表面の一部又は全部が炭素材料及び／又は珪素材料によって被覆された負極活物質」が提案される（たとえば、特許文献2参照）。炭素材料以外の負極活物質として、錫酸化物、珪素酸化物などの金属酸化物（たとえば、特許文献3および4参照）が提案される。

[0005] 特許文献2～4には、それぞれの特許文献に開示の負極活物質と、活性炭である正極活物質との組み合わせが開示されている。特に、特許文献3および4には、珪素酸化物、錫酸化物などの非炭素材料である負極活物質と、活性炭である正極活物質との組み合わせにより、過放電特性に優れた蓄電デバイスが得られるとの開示がある。より具体的には、特許文献3の実施例1では、粒径44μm以下に粉砕、整粒した一酸化ケイ素粒子（負極活物質）と、グラファイト（導電剤）と、ポリアクリル酸（結着剤）とをそれぞれ重量比45:40:15の割合で混合して負極合剤が調製される。この負極合剤を加圧成形することにより、直径4mm、厚み0．19mmのペレット状負極が作製される。このペレット状負極は、負極集電体としての機能をも有する導電性樹脂接着剤によって負極ケースに固定される。このペレット状負極を含む蓄電デバイスは、2V～放電終止電圧0Vまでの過放電領域を含んだ電圧域で動作可能であるが、充放電速度が200時間率（0．005Cレート）と非常に遅く、出力特性が低い。

[0006] ところで、携帯電子機器などの電子機器に多く用いられるリチウム二次電池は、一般に、10～0．5時間率（0．1Cレート～2Cレート）程度の充放電速度を有する。したがって、特許文献3および4の蓄電デバイスはリチウム二次電池の代替用途には使用できないことが明らかである。また、瞬間的に大電流を充放電することが可能である電気二重層キャパシタは、一般に、0．002～0．02時間率（500Cレート～50Cレート）程度の充放電速度を有する。したがって、特許文献3および4の蓄電デバイスは、電気二重層キャパシタの代替用途にも使用できない。このように、特許文献3および4において開示された蓄電デバイスは、高電圧および高容量ではあるものの、充放電速度が遅く、出力特性が低いため、用途が限られる。

[0007] 一方、正極活物質としては、現在汎用される活性炭よりも高容量を有する酸化還元可能な有機化合物が検討されている。酸化還元可能な有機化合物としては、π電子共役雲を有する有機化合物（たとえば、特許文献5および6参照）、ラジカルを有する

有機化合物(たとえば、特許文献7参照)などが提案されている。しかしながら、これらの特許文献には、酸化還元可能な有機化合物である正極活物質と、非炭素材料である負極活物質との組み合わせについては、報告されていない。

[0008] 特許文献1:国際公開第2003/003395号パンフレット

特許文献2:特開2005-093777号公報

特許文献3:特開2000-195555号公報

特許文献4:特開2001-148242号公報

特許文献5:特開2004-111374号公報

特許文献6:特開2004-342605号公報

特許文献7:特開2004-193004号公報

発明の開示

発明が解決しようとする課題

[0009] そこで、本発明は、負極活物質として非炭素材料を用いるにもかかわらず、高速での充放電が可能であり、高出力、高容量、および優れた繰り返し充放電寿命特性を有する蓄電デバイスを提供することを目的とする。

課題を解決するための手段

[0010] 本発明者らは、上記課題を解決するために鋭意研究を重ねた。その結果、電気二重層キャパシタ用の正極活物質と、リチウムイオンを可逆的に吸蔵および放出可能な非炭素材料である負極活物質との組み合わせにおいて、負極を特定の構成とすることによって、充放電速度の高速化ひいては高出力化を達成できることを見出した。すなわち、バインダーを用いることなく、負極集電体上に非炭素材料からなる負極を直接形成することによって、充放電速度が速く、高出力および高容量で、繰り返し充放電寿命特性に優れた蓄電デバイスが得られることを見出し、本発明を完成した。

[0011] すなわち本発明の蓄電デバイスは、正極集電体と、前記正極集電体上に配された、少なくともアニオンを可逆的に吸脱着可能な正極活物質を含む正極と、負極集電体と、前記負極集電体上に配された、実質的に、リチウムイオンを可逆的に吸蔵および放出可能な負極活物質からなる負極と、を備え、前記負極活物質は、珪素、珪素含有合金、珪素化合物、錫、錫含有合金および錫化合物からなる群より選ばれる少

なくとも1つであり、前記負極は厚み10μm以下の薄膜であることを特徴とする。

[0012] 前記負極の単位面積あたりの容量は、0．2～2．0mAh/cm^{2}であるのが好ましい。

前記正極の厚みが、前記負極の厚みの5倍以上であるのが好ましい。

前記負極の比表面積が、5以上であるのが好ましい。

前記負極集電体の比表面積が5以上であるのが好ましい。

[0013] 前記負極集電体の表面粗さRaの値が、前記負極の厚みと同じかまたはそれよりも大きい値であるのが好ましい。

前記負極活物質に予めリチウムが吸蔵されているのが好ましい。

前記負極活物質へのリチウムの吸蔵が機械的に行われるのが好ましい。

前記蓄電デバイスの充放電時において、前記負極のSOCが20％以上95％以下であるのが好ましい。

[0014] 前記負極活物質が、珪素であるのが好ましい。

前記負極活物質が、珪素窒化物または珪素酸窒化物であるのが好ましい。

前記珪素化合物が、式SiOx（0＜x＜2）で表される珪素酸化物であるのが好ましい。

前記正極活物質が活性炭であるのが好ましい。

前記正極活物質が酸化還元可能な有機化合物であるのが好ましい。

前記有機化合物は分子内にラジカルを有するのが好ましい。

前記有機化合物は分子内にπ共役電子雲を有するのが好ましい。

[0015] 前記負極集電体は電解質保持部を有し、前記電解質保持部の容積が前記負極集電体の占有体積の30％以上であるのが好ましい。

前記負極集電体は電解質保持部を有し、前記電解質保持部の容積が前記負極集電体の占有体積の50％以上であるのが好ましい。

前記負極集電体が、厚み方向に貫通する複数の貫通孔を有する多孔質膜であるのが好ましい。

前記負極集電体が、厚み方向に貫通する貫通孔を有さずかつ表面に複数の突起を有し、前記突起の前記負極集電体の厚み方向の断面形状が台形状または擬台形状であるのが好ましい。

前記突起の高さが、前記負極の厚みの2倍以上であるのが好ましい。

前記突起の先端部の少なくとも一部に、負極活物質を含む被覆層が形成されるのが好ましい。

発明の効果

[0016] 本発明によれば、高速で充放電することが可能であり、高出力、高容量、および優れた繰り返し充放電寿命特性を有する蓄電デバイスを提供することができる。高出力時でも容量の低下が起こらず、長時間にわたって高出力を安定的に維持できる蓄電デバイスを提供することができる。

図面の簡単な説明

[0017] [図1]本発明の実施の形態である蓄電デバイス1の構成を模式的に示す縦断面図である。

[図2]負極集電体13の表面に形成された負極12の構成を模式的に示す縦断面図である。

[図3]負極集電体13の表面に形成された別形態の負極12aの構成を模式的に示す縦断面図である。

[図4]負極集電体13の構成を模式的に示す縦断面図である。

[図5]負極12と負極集電体13とからなる負極積層体の構成を模式的に示す縦断面図である。

[図6]別形態の負極集電体30の構成を模式的に示す縦断面図である。

[図7]負極33と図6に示す負極集電体30とからなる負極積層体の構成を模式的に示す縦断面図である

[図8]突起36の厚み方向断面形状が三角形である負極集電体35の構成を模式的に示す縦断面図である。

[図9]突起高さが不足する突起44を有する負極積層体40の構成を模式的に示す縦断面図である。

[図10]本発明の蓄電デバイスを用いた携帯電話の概略斜視図である。

[図11]本発明の蓄電デバイスを用いたノートPCの概略斜視図である。

[図12]本発明の蓄電デバイスを用いたハイブリッド自動車の概略構成図である。

[図13]本発明の実施例6における蓄電デバイス(B－1)に用いた負極集電体53の厚み方向断面の顕微鏡写真である。

[図14]本発明の実施例6における蓄電デバイス(B－1)に用いた負極52と負極集電体53とからなる負極積層体の厚み方向断面の顕微鏡写真である。

[図15]本発明の実施例6における蓄電デバイス(B－3)に用いた負極集電体62の厚み方向断面の顕微鏡写真である。

[図16]本発明の実施例6における蓄電デバイス(B－3)に用いた負極61と負極集電体62とからなる負極積層体の厚み方向断面の顕微鏡写真である。

[図17]本発明の実施例8における、蓄電デバイス(C－1)、(C－3)、(C－6)および(C－8)の充放電繰り返し試験の結果を示す図である。

[図18]本発明の実施例10における蓄電デバイス(D－1)に用いた負極集電体70の厚み方向断面における要部の電子顕微鏡写真である。

[図19]本発明の実施例10における蓄電デバイス(D－6)に用いた負極集電体75の厚み方向断面における要部の電子顕微鏡写真である。

発明を実施するための最良の形態

[0018] 本発明の蓄電デバイスは、正極、正極集電体、負極および負極集電体を含み、つぎの(イ)および(ロ)の特徴を有する。それ以外の構成は、従来の蓄電デバイスと同様である。

(イ)本発明の最大の特徴は、負極がバインダー、特に有機バインダーを含有せず、かつリチウムイオンを可逆的に吸蔵・放出可能な非炭素材料を負極活物質として含有すること、すなわち実質的に負極活物質の層からなる点である。リチウムイオンを可逆的に吸蔵・放出可能な非炭素材料としては、珪素、珪素含有合金、珪素化合物、錫、錫含有合金および錫化合物から選ばれる少なくとも1種が用いられる。

粒子形状の非炭素材料を負極活物質として用いる従来の蓄電デバイスでは、非炭素材料の粒子および導電剤をバインダーで結合することによって負極を構成している。本発明者らの研究によれば、前記のような負極では、活物質粒子間の接触抵抗、活物質粒子と集電体表面との接触抵抗、負極が導電剤を含有する場合の活物質粒子と導電剤との接触抵抗などが発生し、蓄電デバイスの内部抵抗を増大させてい

ることが判明した。このため、充放電速度ひいては出力の低下が顕著になるものと推測される。

[0019] また、本発明のように負極がバインダー、特に有機バインダーを含有しないことによって、初めて蒸着などの薄膜形成プロセスによる機械的充電方法により、負極活物質に予めリチウムを吸蔵させることが可能になる。本発明により、このように負極活物質へのリチウムの機械的な吸蔵が可能になることにより、蓄電デバイスの加工性が顕著に向上する。

[0020] 本発明の蓄電デバイスにおいて、負極は実質的に非炭素材料からなる。なお、本発明は、負極が非炭素材料とともに無機化合物を含有する形態をも包含している。無機化合物は、負極の機械的強度などを向上させることなどを目的として用いられる。非炭素材料と併用される無機化合物は、電池反応に寄与せずかつ負極にLiを吸蔵しても劣化などを起こさない程度の耐熱性を有する無機化合物であり、たとえば、鉄、コバルト、アンチモン、ビスマス、鉛、ニッケル、銅、銀、亜鉛、タリウム、カドミウム、ガリウム、ゲルマニウム、インジウム、チタン、あるいはこれらの化合物、もしくはこれらと珪素の合金、もしくはこれらと錫の合金等などが挙げられる。本発明の負極は、バインダーを含有しないことによって、負極活物質である非炭素材料が連続的に繋がった構造体として形成される。このような構造を採ることによって、負極と負極集電体との電気的な接触抵抗(以下、単に「接触抵抗」とする)を大幅に小さくできる。

[0021] (ロ)負極集電体の表面に、厚み10μm以下の薄膜からなる負極が直接形成される。

粒子形状の非炭素材料を負極活物質として用いる従来技術では、負極は負極集電体に直接形成されるのではなく、別途作製した負極を負極集電体に接着または接合させている。負極は、たとえば、非炭素材料の粒子と導電剤とバインダーとを混合し、得られる混合物をペレット状に加圧成形することにより作製される。たとえば、特許文献3および4のように粒径44μm以下の非炭素材料粒子を用いると、厚み30μm程度の、表面が平滑な負極を作製できないのは明らかである。従来の方法で作製できるペレット状負極の厚みは、非炭素材料粒子をさらに微細化しても数十μm程度が限界であり、たとえば10μm以下のような大幅な薄膜化は困難である。

[0022] これに対し、本発明では、厚み10μm以下の薄膜からなる負極を負極集電体表面

に直接形成することによって、従来に比べて負極厚みを大幅に薄くすることができる。負極は、充放電に伴う電子またはイオンの通り道になる。したがって、負極厚みが薄いと、それだけ電子またはイオンの移動距離が短くなり、抵抗が小さくなって、蓄電デバイスの内部抵抗を低減化できる。また、負極集電体表面に負極を直接形成する場合には、たとえば、蒸着などによって負極を形成できるので、蓄電デバイスの加工性が顕著に向上する。

[0023] このように、本発明の蓄電デバイスは、上記(イ)および(ロ)の特徴を持つことによって、従来の蓄電デバイスよりも内部抵抗が著しく小さくなり、高速での充放電および高出力化が可能になる。さらに、本発明の蓄電デバイスは、負極活物質として非炭素材料を用いることによって、高容量で、繰り返し充放電寿命特性にも優れ、かつ、加工性が顕著に向上した蓄電デバイスを提供することができる。この薄膜負極を用いることにより蓄電デバイスの小型化が可能となる。

なお、ここでいう負極の厚みとは、蓄電デバイス構成時(放電時)における負極の厚みをいう。充放電時において負極活物質はリチウムを可逆的に吸蔵・放出するため、負極の厚みが変化する。

[0024] 単位面積あたりの負極容量としては、0.2～2.0mAh／cm^2の容量を示す負極を利用することができる。好ましくは、単位面積あたりの負極容量は0.2～1.0mAh／cm^2である。なお、ここでいう、負極容量とは、負極単体として、可逆的な充放電が可能な容量のことを指し、後述する不可逆容量を含まない。具体的には、リチウム基準で0～1.5Vの電位範囲において、負極容量に対して0.2CA(5時間率)で充放電させた場合の可逆容量である。

[0025] 以下、本発明の蓄電デバイスの一実施の形態を図を参照しながら説明する。

図1は、本発明の実施の形態であるコイン型蓄電デバイス1の構成を模式的に示す縦断面図である。図2は、負極集電体13表面に形成された負極12の構成を模式的に示す縦断面図である。蓄電デバイス1は、正極10、正極集電体11、負極12、負極集電体13、セパレータ14、封口板15、ガスケット16、スペーサー17およびケース18を含む。蓄電デバイス1は、スペーサー17、負極集電体13、負極12、セパレータ14、正極10および正極集電体11の積層体が、封口板15とケース18とによって形成さ

れる内部空間に収容されてなるコイン型蓄電デバイスである。したがって、図1は蓄電デバイス1の直径方向の断面図と言うこともできる。なお、蓄電デバイス1における、正極集電体11、正極10、セパレータ14、負極12および負極集電体13の積層部分には、ほぼ均等な圧力が付加されている。

[0026] 負極12は、厚み10μm以下の薄膜である。これにより、高速で充放電することが可能であり、高出力、高容量、および優れた繰り返し充放電寿命特性を有する蓄電デバイスが得られる。負極12の厚みは、好ましくは5μm以下であり、より好ましくは2～5μmである。

[0027] 負極12は、リチウムイオンを可逆的に吸蔵および放出可能な負極活物質からなり、実質的にバインダーなどの絶縁材料を含まない。負極活物質は、具体的には、珪素、珪素含有合金、珪素化合物、錫、錫含有合金および錫化合物から選ばれる少なくとも1つの非炭素材料である。特に容量が大きく、負極厚みを5μm以下に容易に薄くできるため、これらのなかでも、負極活物質は珪素であるのが好ましい。

珪素含有合金としては、たとえば、珪素と、鉄、コバルト、アンチモン、ビスマス、鉛、ニッケル、銅、亜鉛、ゲルマニウム、インジウム、錫およびチタンから選ばれる少なくとも1種の元素との合金などが挙げられる。珪素化合物としては、珪素含有合金以外の珪素を含む化合物であれば特に制限されないが、好ましくは珪素酸化物、珪素窒化物、珪素酸窒化物などである。珪素酸化物としては、たとえば、式SiO_x（$0<x<2$）で表される酸化珪素が挙げられる。この酸化珪素は、窒素、硫黄などの元素を含んでもよい。珪素窒化物としては、たとえば、式Si_3N_y（$3<y\leq 4$）で表される窒化珪素が挙げられる。これらの中でも、Si_3N_4が好ましい。珪素酸窒化物としては、珪素、酸素および窒素を主成分として含み、不純物として上記3種以外の元素（たとえば炭素、水素など）を含むことがある化合物を使用できる。たとえば、SiO_aN_bという組成式では、a／b＝0．2～5．0程度のものを好ましく使用できる。錫含有合金としては、たとえば、錫と、鉄、コバルト、アンチモン、ビスマス、鉛、ニッケル、銅、銀、亜鉛、タリウム、カドミウム、ガリウム、ゲルマニウム、インジウムおよび珪素から選ばれる少なくとも1種の元素との合金などが挙げられる。錫化合物としては、錫含有合金以外の錫を含む化合物であれば特に制限されないが、好ましくは錫酸化物である。錫酸化物としては

、たとえば、式SnOx（xは上記に同じ）で表される酸化錫が挙げられる。この酸化錫は、窒素、硫黄などの元素を含んでもよい。

[0028] これらの非炭素材料はさらに非金属元素を含んでもよい。非金属元素としては特に制限されないが、たとえば、水素、ナトリウム、カリウム、ルビジウムなどのアルカリ金属、マグネシウム、カルシウムなどのアルカリ土類金属、炭素、ホウ素、窒素、リンなどが挙げられる。

これらの非炭素材料の中でも、珪素化合物が好ましく、珪素酸化物がさらに好ましく、式SiOx（xは上記に同じ）で表される酸化珪素が特に好ましい。非炭素材料は1種を単独で使用できまたは必要に応じて2種以上を組み合わせて使用できる。

[0029] これらの非炭素材料はエネルギー量が非常に大きいという特徴を有する。従来から負極活物質として使用される炭素材料（以下、「従来の炭素材料」とする）の体積当りのエネルギー密度が500～600mAh／ccであるのに対し、たとえば、珪素2400mAh／cc、錫酸化物1400mAh／ccと、3～5倍のエネルギー密度を有する。よって、従来の炭素材料を用いる場合とは異なり、正極10および負極12の厚みバランスを適宜調整することが可能になる。たとえば、厚み数μm程度の薄膜状の負極12を設けることが可能になる。負極12を非炭素材料で薄膜状に形成することによって、蓄電デバイス1の高出力化とともに、小型化、高容量化などが可能になる。また、非炭素材料は、活性炭などの電気二重層キャパシタの正極活物質が30mAh／cc程度の体積エネルギー密度であることから、これに比べても50～80倍程度の非常に大きなエネルギー密度を有する。また、非炭素材料は、従来の炭素材料と同様に負極電位が低いので、3V程度の高電圧を有する蓄電デバイス1が得られる。

[0030] 薄膜状の負極12を負極集電体13表面に直接形成するには、たとえば、真空蒸着法、スパッタリング法、ガスデポジション法、CVD法、めっき法などの一般的な成膜方法を利用できる。このとき、成膜条件を適宜選択することによって、負極厚みを調整できる。非炭素材料と無機化合物とを含む負極を形成する場合、無機化合物の特性に応じて、成膜方法を適宜選択すればよい。たとえば、無機化合物が蒸着可能な化合物であれば、非炭素材料と無機化合物との共蒸着によって負極を形成することができる。本実施の形態では、図2に示すように、負極集電体13表面の全面に負極12を

形成するが、それに限定されず、負極集電体13表面にパターン状に負極12を形成しても良い。パターンに形成した負極としては、たとえば、図3に示す負極12aが挙げられる。図3は、負極集電体13表面に形成された別形態の負極12aの構成を模式的に示す縦断面図である。負極12aは、負極集電体13表面に縞状に形成される。これに限定されず、たとえば、格子状、円形の縞状などのパターン状に形成してもよい。負極集電体13上にパターン状に負極12を形成する方法としては、たとえば、マスクを用いて負極12の成膜を行う方法、表面に凹凸を有する負極集電体13に対して斜方蒸着を行う方法、負極集電体13の表面全面に負極12を形成した後、エッチングなどによって負極12を部分的に除去する方法などが挙げられる。

[0031] 負極12は、好ましくは比表面積5以上、より好ましくは10以上の薄膜状に形成される。比表面積が5未満では、蓄電デバイス1の高出力時における容量低下が顕著になり、安定的な高出力が得られないおそれがある。なお、比表面積の上限はないが、現状では10程度のものが形成可能である。

負極12の比表面積は、たとえば、真空蒸着法、スパッタリング法などの一般的な成膜方法に従って負極を作製する場合、成膜条件を適宜選択することによって調整できる。

[0032] 本明細書において、比表面積は、設定される測定範囲の表面積と、測定範囲の見掛け上の面積との比(測定範囲の表面積／測定範囲の見掛け上の面積)を意味する。測定範囲の表面積は、レーザー顕微鏡(商品名:超深度形状測定顕微鏡VK－855、キーエンス社製)を用いて測定される。物質の表面積の測定方法には、物質の外郭面積のみを測定する方法、物質の外郭面積と物質表面の凹凸、亀裂の面積とを測定する方法、物質の外郭面積および物質表面の凹凸、亀裂の面積とともに、物質内部に延びる細孔の面積を測定する方法などがある。そして、測定方法に応じて異なる意義を有する比表面積が求められる。レーザーを利用する表面積測定方法は、測定対象を破壊することなく、測定範囲の表面積(物質の外郭面積と物質表面の凹凸、亀裂の面積との和)を簡便に測定できる。さらに、レーザーを利用する表面積測定方法は、比表面積値が3～10程度の物質の表面積をほぼ正確に測定できるという利点を有する。したがって、本発明において負極12、負極集電体13などの表面積を

測定するのに好適である。一方、測定範囲の見掛け上の面積とは、測定範囲を平面と仮定した場合の面積である。したがって、見掛け上の面積は測定範囲を設定することによって自動的に算出できる。なお、本発明の測定方法では、測定範囲を鉛直方向上方から見たときに、影になって見えない部分の凹凸および亀裂は測定には含まれない。ここで「見えない」とはレーザー顕微鏡によって認識されないことである。

[0033] 測定範囲は、次のように設定される。まず、測定対象物質の表面から1つの突起を選択し、これを第1の突起とする。第1の突起周縁部の各辺の幅をWとする。Wの値は実際には辺ごとに変化する。次に、第1の突起の中心部において、第1の突起と相似形であり、周縁部の各辺の幅がW／2以下である部分を測定範囲とする。

[0034] また、負極集電体13の負極12が形成される面の表面粗さ(算術平均表面粗さ)Raの値(ラフネス値)を特定の範囲に調整することによっても、所定の厚みおよび比表面積を有する負極12を形成できる。負極集電体13の表面粗さRaを調整すれば、成膜条件を厳密に調整しないでも、所定の比表面積を有する負極12を容易に形成できる。このとき、負極集電体13の表面粗さRaの値が、負極12の厚みと同じかまたはそれよりも大きい値であることが好ましい。換言すれば、形成直後のリチウムを全く含まない負極12の厚みが、負極集電体13の表面粗さRaの値以下であることが好ましい。これによって、負極集電体13表面の凹凸が負極12表面にほぼ正確に再現され、所定の比表面積を有する負極12が得られる。負極12の厚みが、負極集電体13の表面粗さRaの値を超えると、負極集電体13表面の凹凸に対する負極12の追従性がなくなる。その結果、負極集電体13表面の凹凸が負極12によって平坦化され、所定の比表面積を有する負極12が得られないおそれがある。負極集電体13の表面粗さRaは、好ましくは10μm以下、より好ましくは5μm以下、さらに好ましくは1～2μmである。負極集電体13の表面粗さRaは、たとえば、一般的な粗面化処理方法などによって適宜調整できる。本明細書において、負極集電体13の表面粗さRaは、日本工業規格のJIS B0601－1994に規定される方法によって測定される値である。

[0035] さらに、負極集電体13の負極12が形成される面の比表面積を好ましくは5以上、より好ましくは10以上に調整することによっても、所定の厚みおよび比表面積を有する負極12を比較的容易に形成できる。このときも、負極12の厚みが、負極集電体13の

表面粗さRaの値以下になるように、たとえば、成膜時間などの成膜条件を適宜選択するのがよい。

[0036] 蓄電デバイスの充放電時において、負極のSOC(state of charge)は20%以上95%以下であるのが好ましい。これにより、高容量および高出力を有し、かつ充放電繰り返し寿命特性に優れた蓄電デバイスが得られる。

なお、負極のSOCとは、蓄電デバイスとしてではなく、負極単体の充電状態を表す指標であり、負極単体の満充電時の容量(可逆容量)を100%として、満充電量に対する充電量の割合を百分率で表した値である。従って、完全に放電された状態のSOCは0%であり、満充電状態のSOCは100%である。

負極のSOCは、以下の方法により求められる。リチウム基準で0～1．5Vの電位範囲において、負極容量に対して0．2CA(5時間率)で充電させた場合の負極の充電量をSOCが100%である(満充電である)と定義し、この充電量を基準としてSOCの値を求めることができる。

[0037] 負極集電体13は、図4および図5に示すように、膜状の負極集電体13を厚み方向に貫通する複数の貫通孔20を有し、この貫通孔20が電解質保持部になる。負極集電体13の内部には、主に負極集電体13の厚み方向に延びる複数の連続気泡21が存在する。連続気泡21の一端は負極集電体13の厚み方向における一方の表面に達し、連続気泡21の他端は負極集電体13の厚み方向における他方の表面に達する。連続気泡21は複数の気泡が連続的に繋がり、個々の気泡は内部空間を有するので、連続気泡21の内部では個々の気泡の内部空間が連通して1つの貫通孔20が形成される。

[0038] 貫通孔20を有することにより、この貫通孔20の中に電解液を含浸および保持させることができる。すなわち、負極12に接して設けられる負極集電体13内部に、アニオン、カチオンの電解質(電解液)を保持できる。負極12がその内部に電解質を充分に保持できなくても、負極集電体13内部に充分な量の電解質を保持することにより、蓄電デバイス1内部に必要な量の電解質を確保することができる。図5では、複数の貫通孔20を有する負極集電体13における厚み方向の一方の面に、負極12が形成される。負極12が負極集電体13上に成膜された後も、貫通孔20を通して、負極集

電体13内部に電解質を含浸および保持させるには、好ましくは、負極12の厚みを貫通孔20の孔径よりも小さくするのがよい。換言すれば、貫通孔20の孔径は、負極12の厚みよりも大きいことが好ましい。具体的には、貫通孔20の孔径は、好ましくは負極12の厚みの2倍以上、より好ましくは5倍以上、さらに好ましくは5倍～100倍である。なお、貫通孔20の孔径は、たとえばガス吸着測定あるいは水銀ポロシメータにより測定することができる。また、貫通孔20の孔径は、一般的に分布を持っていることが多いため、体積基準メディアン細孔径を代表値として、貫通孔20の孔径として扱うことができる。

[0039] 負極集電体13の占有体積に対する電解質保持部の容積（貫通孔20の内部容積の総和）の割合（以下、単に「電解液保持部の容積比率」とする）は、30%以上であるのが好ましい。

電解質保持部の容積比率は、より好ましくは50%以上、さらに好ましくは50～95%である。電解質保持部の容積比率が30%未満では、負極12近傍における電解質塩量が不十分になり、蓄電デバイス1の充放電容量が低下する場合がある。なお、電解質保持部の容積比率の測定には、たとえばガス吸着測定あるいは水銀ポロシメータにより測定することができる。ガス吸着測定の例としては、比表面積・細孔分布測定器（商品名：ASAP2010、（株）島津製作所製）を用いる測定が一例として挙げられる。この測定装置はガスの吸脱着を利用して細孔容積を測定する装置であり、数Å～0．1μm程度の細孔径を有する細孔の測定が可能である。また、別の一例としては水銀ポロシメータ（商品名：オートポアIII9410、（株）島津製作所製）を用いる測定が一例として挙げられる。この測定装置は細孔への水銀の圧入を利用して細孔容積を測定する装置であり、数nm～500μm程度の細孔径を有する細孔の測定が可能である。これら測定装置は、対象物の細孔径に応じて使い分けることができる。

[0040] 貫通孔20を有する負極集電体13としては、たとえば、発泡体、メッシュ体などの多孔質体を使用できる。また、負極集電体13を構成する素材としては、リチウムイオン電池の負極集電体に用いられるものを使用できるが、多孔質化の加工性などを考慮すると、銅、ニッケルなどの金属素材が好ましい。なお、発泡体では、発泡体内部に形成される連続気泡が電解質保持部であり、連続気泡の容積の総和が電解質保持

部の容積であり、発泡体の空隙率が負極集電体13の占有体積に対する電解質保持部の容積比率になる。

[0041] ここで、図6は、別形態の負極集電体30の構成を模式的に示す縦断面図である。図7は、薄膜負極33と図6に示す負極集電体30とからなる負極積層体の構成を模式的に示す縦断面図である。負極集電体30は、集電膜31と、突起32とを含むことを特徴とする。集電膜31は、リチウムイオン電池の負極集電体に用いられる素材で構成される。突起32は、集電膜31の厚み方向の両面に、集電膜31表面から集電膜31の外方に向けて延びるように、複数形成される。集電膜31は、厚み方向に貫通する貫通孔を有しない。

[0042] 負極集電体30においては、少なくとも突起32の先端部に負極33が形成される。この負極集電体30とセパレータ14とを、負極33を介して接触させると、突起32の存在により、負極集電体30とセパレータ14とが直接接触しない空間が形成される。この空間に電解質を含浸および保持させることにより、負極33近傍で負極反応に必要な電解質塩量を確保できる。すなわち、この空間が電解質保持部になる。

電解質保持部の容積は、集電体面積に対する突起の非占有面積と、突起高さを掛けることにより、計算により算出することができる。ここで、集電体面積に対する突起の非占有面積とは、集電体膜の面積において、集電体表面に突起が形成されていない部分の総面積の割合である。突起高さ、および集電体面積に対する突起の非占有面積は、レーザー顕微鏡あるいは電子顕微鏡を用いた、集電体膜の表面観察、および断面観察により測定することができる。具体的には、たとえば、レーザー顕微鏡(商品名:VK－855、キーエンス社製)などを用いることができる。

[0043] 突起32は、その表面に設けられる負極33を介して、点ではなく面でセパレータ14に接触するように形成するのが好ましい。したがって、突起32は、好ましくはその先端(集電膜31から最も遠い部分)が面になるように形成され、さらに好ましくはその先端が集電膜31表面に平行な面になるように形成される。突起32の先端が面になることによって、その先端面がセパレータ14を確実に支持するので、蓄電デバイス1の耐用期間全般にわたって、電解質保持部の容積がほぼ同じに保持される。また、突起32の先端がセパレータ14を貫通して正負極を短絡させ、蓄電デバイス1の製品歩留

まりを低下させることがない。突起32は、先端が面であればそれ以外の形状は特に制限されず、種々の形状に形成することが可能である。ただし、セパレータ14の安定的に支持することなどを考慮すると、負極集電体30の厚み方向の断面形状が台形状または擬台形状になるように形成するのが好ましい。擬台形状とは、厚み方向の断面がほぼ台形に近い形状であり、集電膜31から遠い方の辺（以下「上辺」とする）よりも集電膜31表面に接触する辺（以下「下辺」とする）が長くかつ上辺が下辺に対してわずかに平行でない形状である。この場合、上辺の延長線と下辺の延長線とがなす角の角度は数度程度である。また、厚み方向の断面における上辺の少なくとも一部が曲線を含んでいてもよい。擬台形状であっても、面でセパレータ14を支持できれば、前記のような効果が得られる。

[0044] ここで、さらに別形態の負極集電体35の構成を模式的に示す縦断面図を図8に示す。負極集電体35は、図8に示すように、突起36の厚み方向断面形状が三角形であり、突起36の先端は尖って点になる。突起36の先端が点であると、その先端の少なくとも一部がセパレータ14内に侵入し、場合によってセパレータ14を貫通するおそれがある。また、突起36の先端がセパレータ14を貫通して正負極を短絡させ、蓄電デバイス1の製品歩留まりを低下させるおそれがある。

負極集電体30の占有体積は、集電膜31の厚み方向表面の面積と負極集電体30の厚みtとを乗じた値である。ここで、負極集電体30の厚みtは、集電膜31の一方の面に形成される突起32の最頂部から他方の面に形成される突起32の最頂部までの長さを言う。負極集電体30の占有体積に対する電解質保持部の割合を30%以上にするためには、たとえば、突起32の高さ、突起32の先端に形成される面の面積の総和、突起32同士の間隔、突起32の数などを適宜調整すればよい。突起32の高さとは、集電膜31表面から突起32の最頂部までの長さを言う。

[0045] 負極集電体30は、たとえば、集電膜31に機械的加工を施し、集電膜31の厚み方向の表面に複数の突起32を形成することによって製造できる。機械的加工とは、たとえば、プレス加工、ローラー加工などである。また、集電膜31に、研磨、エッチング、パターニングなどの表面加工、めっき処理（電解めっき、無電解めっき、電着めっきなど）、微粒子の吹き付け処理などを施すことによっても、負極集電体30を得ることがで

きる。ここで、集電膜31には、たとえば、銅箔、ニッケル箔などを使用できる。

[0046] また、負極集電体30表面に負極33を形成するに際しては、負極33の厚みと突起32の高さとの関係に留意するのが好ましい。図7に示すように、負極33が負極集電体30表面の形状を追従するように形成され、負極33表面に突起32の形状が再現されるのが好ましい。これにより、負極33の形成後も、負極33表面に、電解質を保持するための空間である電解質保持部を確保できる。したがって、負極集電体30表面に存在する突起32の高さに対して負極33の厚みが十分に薄いことが必要である。具体的には、突起32の高さを、好ましくは負極33の厚みの2倍以上、より好ましく負極33の厚みの5倍以上、さらに好ましくは5～10倍にするのがよい。

[0047] 突起32の高さが、負極33の厚みの2倍未満である場合には、突起32により確保される電解質保持部の空間が小さくなる。図9は、負極積層体40の構成を模式的に示す縦断面図である。負極積層体40は、負極41と、負極集電体42とを含む。負極集電体42は、集電膜43と突起44とを含む。負極積層体40においては、突起44の高さが、負極41の成膜厚みの2倍未満である。負極41は、突起44先端の面だけでなく、突起44の側面にも形成されるので、特に隣り合う突起44の間の空間が狭まる。その結果、突起44の存在によって形成されるべき電解質保持部の空間が極端に小さくなり、負極集電体42が保持可能な電解液量が減少する。

なお、負極集電体30では、厚み方向の両面に突起32を形成するが、それに限定されず、負極集電体30のセパレータ14に接触する面にのみ複数の突起32を形成してもよい。その場合は、突起32が形成された面のみに薄膜負極33を設けてもよい。

[0048] また、負極12を負極集電体13表面に形成した後、負極12に所定の電気量を予め充電しておくのが好ましい。すなわち、負極12に所定量のリチウムを予め吸蔵させておくのが好ましい。本明細書において、負極12に電気量を予め充電するとは、蓄電デバイス1の作製(組み立て)に先立って、負極12に電気量を充電し、負極活物質にリチウムを吸蔵させておくことである。これは、蓄電デバイス1の作製直後の負極12が不可逆容量を有することなどによるものである。不可逆容量とは、負極12に充電される電気容量のうち、負極活物質の充放電反応に寄与するリチウムの吸蔵・放出反応以外の副反応に消費される分に相当する容量のことをいう。すなわち、不可逆容量と

は、充電したにもかかわらず、可逆的に放電できない容量であり、最初の充放電においてのみ観測されることが良く知られている。

[0049] 負極12に予め所定の電気量を充電するに際しては、公知の方法を採用でき、たとえば、機械的充電方法、電気化学的充電方法、化学的充電方法などが挙げられる。機械的充電方法によれば、たとえば、負極活物質よりも電位の低い材料(金属リチウムなど)を負極活物質に機械的に接触させることにより充電する。より具体的には、たとえば、負極12表面に所定量の金属リチウムを貼り付けるか、負極12表面に蒸着などの真空プロセスによって金属リチウムを直接成膜するか、または、離型処理を施したプラスチック基板上で作製した金属リチウムを負極12表面に転写した後、充電すればよい。また、機械的充電方法では、負極活物質よりも電位の低い材料を負極12表面に接触させた後に、負極12を加熱することにより充電反応の進行を早め、充電反応の所要時間を短縮することも可能である。

[0050] 電気化学的充電方法によれば、たとえば、負極12と対極とを電解液中に浸漬させ、負極12と対極との間に電流を通電させることにより、負極12を充電する。このとき、対極としては、たとえば、金属リチウムを使用できる。電解液としては、たとえば、リチウム塩を溶解させた非水溶媒を使用できる。また、リチウムイオン電池に用いられる一般的な電解液を使用してもよい。蓄電デバイス1を作製した後に、蓄電デバイス1の内部に、正極10および負極12以外に、負極12に電気化学的充電処理を施すための図示しない第3の電極を導入すれば、蓄電デバイス1のセル構成後に負極12に充電処理を施すことも可能である。

化学的充電方法によれば、たとえば、ブチルリチウムなどのリチウムイオンを含有する化合物を有機溶媒中に溶解させ、この溶液と負極12とを接触させ、化学反応を生起させることにより、負極12を充電する。リチウムイオンを含有する化合物の溶液と負極12との接触は、たとえば、該溶液中に負極12を浸漬させることにより行われる。

[0051] これらの充電方法のうち、電気化学的充電方法および化学的充電方法では、充電後に負極12を取り出し、負極12の表面に付着する溶媒、電解質塩その他の充電処理に用いる化合物などを洗浄により除去する必要がある。また、充電処理そのものにも長時間を要する。また、充電後の負極12はリチウム電位に近くかつ非常に低い電

位になり、反応性が高くなるため、充電後の負極12の洗浄時に、負極12表面が劣化する場合がある。これに対し、機械的充電方法では、負極12にリチウムのみを接触させるため、洗浄の必要がなく、また所要時間も短い。負極12表面の劣化もない。

[0052] したがって、製造面および特性面から、機械的充電方法が好ましい。特に、機械的充電方法の中でも、負極12表面に蒸着などの薄膜形成プロセスによって金属リチウムを直接成膜する方法が最も望ましい。なぜなら、本発明の蓄電デバイスにおける負極12は、厚み10μm以下の薄膜負極であるため、充電すべきリチウムもまた同様に、厚み10μm以下、場合によっては5μm以下の薄膜で制御する必要があるため、金属リチウムの貼り付け処理などは事実上制御が困難となる。したがって、蒸着などの薄膜形成プロセスによる機械的充電方法が、厚み制御性、加工時間の観点から望ましい。機械的充電方法を実施することによって、蓄電デバイスの加工性が顕著に向上する。

[0053] また、負極12に所定の電気量を充電する際においても、本発明の蓄電デバイス1における、負極集電体13上にバインダーを含まず直接形成した負極12が有効となる。この理由について、以下に説明する。たとえば、蒸着法により負極12上にリチウムを成膜し、機械的充電を行う場合、リチウムの融点が179℃であることから、負極12は少なくとも179℃前後の高温に加熱されたリチウムに曝されることになる。この際、バインダーを含む負極上にリチウムを成膜すると、バインダーの主成分として用いられる樹脂材料の多くは、リチウムのように化学的な反応性に富みかつ179℃前後の温度まで加熱された材料と化学反応を起して劣化する。一方、本発明の蓄電デバイス1では、負極12はバインダーを含まない状態で負極集電体13表面に直接形成されているので、蒸着などの薄膜形成法を利用する機械的充電方法を適用でき、非常に有効である。

[0054] 負極集電体13としては、各種蓄電デバイスにおいて負極集電体に用いられるものを使用でき、その中でも、リチウムイオン電池の負極集電体に用いられるものを好ましく使用できる。このような負極集電体の具体例としては、たとえば、銅、ニッケルなどの金属からなる金属箔が挙げられる。これらの中でも、加工性などを考慮すると、銅箔が好ましい。負極集電板13の形態としては、たとえば、表面が平滑なフィルム状、表

面を粗面化したフィルム状、細い金属繊維からなるメッシュ状、多孔質フィルム状などが挙げられる。表面を粗面化したフィルム状の負極集電板13を用いる場合、負極12との密着性、蓄電デバイス1の出力特性などを考慮すると、負極集電板13の表面粗さ(Ra)は好ましくは1～2μm程度であり、また、好ましくは比表面積5以上、さらに好ましくは10以上である。

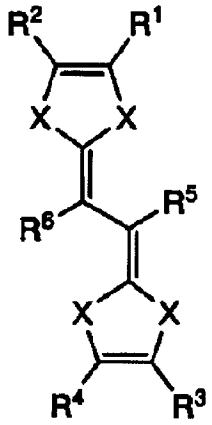
[0055] 層状の正極10は、厚み方向の一方の面がセパレータ14に接しかつ他方の面が正極集電体11に接するように設けられ、正極活物質を含む。さらに正極10は、正極活物質とともに、イオン伝導助材、電子伝導助材、バインダーなどを含んでもよい。

正極活物質としては、充放電時において、少なくともアニオンを可逆的に吸脱着可能な材料を使用できる。たとえば、電気二重層キャパシタに用いられる正極活物質、電気化学キャパシタに用いられる正極活物質などが挙げられる。上記正極活物質に用いられる材料はカチオンを可逆的に吸脱着できてもよい。

電気二重層キャパシタに用いられる正極活物質としては特に制限されないが、活性炭、酸化還元可能な有機化合物などを好ましく使用できる。活性炭としては、比表面積の高い活性炭が好ましい。たとえば、炭素材料(椰子殻、有機樹脂、石油ピッチなど)を、窒素ガスなどの不活性ガス中にて900～1000℃の温度下で炭化した後、この系内に水蒸気を導入することによって、最大2000m^2／g程度の極めて比表面積の高い活性炭が得られる。活性炭の形状は特に制限されず、たとえば、粉末状、繊維状、薄片状(または鱗片状)などの形状が挙げられる。

[0056] 酸化還元可能な有機化合物としては、たとえば、ラジカルを有する有機化合物、π電子共役雲を有する有機化合物、インドール系有機化合物などが挙げられる。ラジカルを有する有機化合物としては、たとえば、分子内にニトロキシラジカル、ホウ素ラジカルおよび酸素ラジカルから選ばれる少なくとも1種のラジカルを有する有機化合物が挙げられる。このような有機化合物の具体例としては、たとえば、2，2，6，6－テトラメチルピペリジン－1－オキシル、2，2，5，5－テトラメチル－3－イミダゾリウム－1－ロキシなどのニトロキシラジカル含有化合物、キノン、ベンゾキノンなどのキノン類などが挙げられる。π電子共役雲を有する有機化合物としては、たとえば、下記の一般式(1)で表される構造を有する有機化合物が挙げられる。

[0057] [化1]

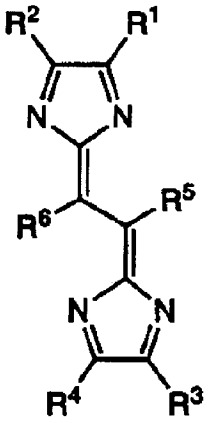


(1)

[0058] 一般式(1)中、4つのXはそれぞれ独立して硫黄原子または酸素原子を示す。R^1～R^4はそれぞれ独立して鎖状脂肪族基、環状脂肪族基、水素原子、ヒドロキシル基、シアノ基、アミノ基、ニトロ基またはニトロソ基を示す。R^5およびR^6はそれぞれ独立して水素原子、鎖状脂肪族基または環状脂肪族基を示す。但し、R^1～R^6で示される鎖状脂肪族基および環状脂肪族基は、酸素原子、窒素原子、硫黄原子、珪素原子、リン原子、ホウ素原子およびハロゲン原子からなる群より選ばれる少なくとも1種の原子を含んでもよい。

下記の一般式(2)で表される構造を有する有機化合物が挙げられる。

[0059] [化2]

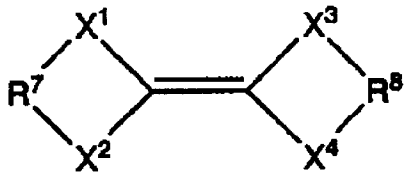


(2)

[0060] 一般式(2)中におけるR^1～R^6は一般式(1)のR^1～R^6と同じである。

下記の一般式(3)で表される構造を有する有機化合物が挙げられる。

[0061] [化3]



(3)

[0062] 一般式(3)中、X^1～X^4はそれぞれ独立して硫黄原子、酸素原子、セレン原子またはテルル原子を示す。R^7およびR^8はそれぞれ独立して2価の鎖状脂肪族基または2価の環状脂肪族基を示す。但し、R^7～R^8で示される2価の鎖状脂肪族基および2価の環状脂肪族基は、酸素原子、窒素原子、硫黄原子、珪素原子、リン原子、ホウ素原子およびハロゲン原子からなる群より選ばれる少なくとも1種の原子を含んでもよい。

[0063] なお、上記一般式(1)～(3)において、R^1～R^8で示される1価または2価の鎖状脂肪族基および環状脂肪族基は、その分子鎖中に、酸素原子、窒素原子、硫黄原子、リン原子などの原子を有していても良い。ここで、酸素原子、窒素原子、硫黄原子、シリコン原子などの原子を有していても良いとは、これらの原子の少なくとも1つを含む基を有していてもよいことを意味する。窒素原子を有する基としては、たとえば、アミノ基、イミノ基、シアノ基、ニトロ基などが挙げられる。酸素原子を有する基としては、たとえば、アルコキシ基、水酸基、水酸基を有するアルキル基、オキソ基などが挙げられる。硫黄原子を有する基としては、たとえば、スルホ基、スルホニル基、スルホン酸基、チオカルボニル基、スルファモイル基、アルキルスルホニル基などが挙げられる。シリコン原子を有する基としては、たとえば、シリル基などが挙げられる。また、アルキル基、アルケニル基などにおける飽和または不飽和の炭素鎖の途中にこれらの原子の少なくとも1種が組み込まれていてもよい。ホウ素原子およびハロゲン原子は各種置換基に結合できる。ホウ素原子およびハロゲン原子は、R^1～R^8で示される1価または2価の鎖状脂肪族基および環状脂肪族基に直接置換していても良い。

[0064] インドール系有機化合物としては、たとえば、5－シアノインドールなどのインドール3量体、その誘導体などが挙げられる。

また、電気化学キャパシタに用いられる正極活物質としては、電気二重層キャパシタに常用される正極活物質のほかに、酸化還元反応により発現する擬似二重層容量を有する材料をも含む。このような正極活物質の具体例としては、たとえば、酸化ルテニウム、酸化イリジウム、酸化マンガンなどの金属酸化物、ナノゲートカーボン、カーボンナノチューブなどのナノカーボン材料などが挙げられる。正極活物質は1種を単独でまたは必要に応じて2種以上を組み合わせて使用できる。

[0065] イオン伝導助材は、たとえば、イオン伝導性を改善するために用いられる。イオン伝導助材の具体例としては、たとえば、ポリエチレンオキシドなどの固体電解質、ポリメタクリル酸メチルなどを含むゲル電解質などが挙げられる。

電子伝導助材は、たとえば、電子伝導性を改善するために用いられる。電子伝導助材の具体例としては、たとえば、カーボンブラック、グラファイト、アセチレンブラックなどの炭素材料、ポリアニリン、ポリピロール、ポリチオフェンなどの導電性高分子な

どが挙げられる。

バインダーは、たとえば、正極活物質の結着性を改善するために用いられる。バインダーとしては、たとえば、ポリフッ化ビニリデン、フッ化ビニリデン－ヘキサフルオロプロピレン共重合体、フッ化ビニリデン－ポリテトラフルオロエチレン、ポリテトラフルオロエチレン、ポリエチレン、ポリイミド、ポリアクリル酸、カルボキシメチルセルロース、アクリロニトリルゴム、ブタジエンゴム、スチレンブタジエンゴムなどが挙げられる。

[0066] 正極10の厚み（以下、「正極厚み」とする）は特に制限されないが、たとえば、電解質保持性などを考慮すると、好ましくは負極12の厚み（以下、「負極厚み」とする）の5倍以上、さらに好ましくは負極厚みの10倍以上である。なお、正極厚みの負極厚みに対する上限は、50～100倍程度である。負極厚みに対して、正極厚みが50～100倍程度と厚すぎる場合、蓄電デバイスの蓄電容量が負極規制になってしまい、容量低下が起こってしまうためである。本発明の蓄電デバイス1においては、上記したように、負極集電体13の表面に負極12を直接形成することによって、負極厚みを薄くする。したがって、負極12内部での電解質保持性が低下するおそれがある。それを補うために、正極厚みを大きくするのが好ましい。

具体的には、負極厚みが2～10μm程度、正極厚みがその10倍以上となる20～100μm程度が望ましい。さらに好ましくは、負極厚みは2～5μm、正極厚みがその10倍以上となる20～50μm程度が望ましい。

[0067] 層状の正極集電体11は、厚み方向の一方の面が正極10に接し、かつ他方の面がケース18に接するように設けられる。正極集電体11としては、リチウムイオン電池の正極集電板に用いられる一般的な材料を使用でき、たとえば、アルミニウム、ステンレス鋼などが挙げられる。正極集電体11は、好ましくは、フィルム状またはシート状に形成される。また、正極集電体11の表面形態は平滑でも粗面化されていてもよい。正極集電体11の内部構造は、金属繊維を含むメッシュ体、多孔質体などでもよい。

[0068] セパレータ14は、正極10と負極12とにより挟持されるように設けられる。セパレータ14には、リチウムイオン電池、電気二重層キャパシタなどに用いられるセパレータを使用でき、たとえば、ポリプロピレン、ポリエチレンなどの微多孔膜、不織布などが挙げられる。

セパレータ14には、必要に応じて、電解質が担持されるかまたは含浸される。電解質としては特に制限されないが、たとえば、支持塩（電解質塩）、支持塩を非水溶媒に溶解した液状電解質（または非水電解液）、ゲル電解質、固体電解質などが挙げられる。

[0069] 支持塩は、蓄電デバイス1の種類に応じて、公知の支持塩の中から適宜選択して使用できる。たとえば、蓄電デバイス1をリチウムイオン電池として用いる場合には、リチウムとアニオンとを含む塩を使用できる。アニオンとしてはリチウムと塩を形成するものであれば特に制限されないが、たとえば、ハロゲン化物アニオン、過塩素酸アニオン、トリフルオロメタンスルホン酸アニオン、4フッ化ホウ酸アニオン（BF_4^-）、6フッ化リン酸アニオン（PF_6^-）、ビス（トリフルオロメタンスルホニル）イミドアニオン、ビス（パーフルオロエチルスルホニル）イミドアニオンなどが挙げられる。支持塩は1種を単独で使用できまたは必要に応じて2種以上を組み合わせて用いてもよい。

[0070] 支持塩を溶解させる非水溶媒も、蓄電デバイス1の種類に応じて、公知の非水溶媒の中から適宜選択して使用できる。たとえば、蓄電デバイス1がリチウムイオン電池、非水系電気二重層キャパシタなどである場合は、非水溶媒としては、たとえば、エチレンカーボネート、プロピレンカーボネート、ジメチルカーボネート、ジエチルカーボネート、メチルエチルカーボネート、γ－ブチロラクトン、テトラヒドロフラン、ジオキソラン、スルホラン、ジメチルホルムアミド、アセトニトリルなどを使用できる。非水溶媒は1種を単独で用いてもよくまたは2種以上を組み合わせて用いてもよい。

[0071] ゲル電解質は、液状電解質をゲル化したものである。液状電解質のゲル化は、たとえば、液状電解質にゲル化剤を添加することにより行われる。ゲル化剤としてはこの分野で常用されるものを使用でき、たえとば、ポリアクリロニトリル、アクリレート化合物またはメタクリレート化合物をモノマー成分として含む重合体、エチレンとアクリロニトリルとの共重合体などが挙げられる。固体電解質は、固形状の電解質である。固体電解質としては、たとえば、Li_2S-SiS_2、$Li_2S-B_2S_5$、$Li_2S-P_2S_5-GeS_2$、ナトリウムとアルミナ（Al_2O_3）との混合物、無定形ポリエーテル、相転移温度（Tg）の低いポリエーテル、無定形フッ化ビニリデン－6フッ化プロピレンコポリマー、異種高分子ブレンド体ポリエチレンオキサイドなどが挙げられる。ゲル電解質および固体電解質を用いる

場合、セパレータ14を用いずに、正極10と負極12との間に電解質のみを配して蓄電デバイス1を構成してもよい。

[0072] 封口板15、ガスケット16、スペーサー17およびケース18としては、この分野で常用されるものをいずれも使用できる。

蓄電デバイス1は、たとえば、スペーサー17、負極集電体13、負極12、セパレータ14、正極10および正極集電体11をこの順番で厚み方向に積層し、得られる積層体を封口板15とケース18とによって挟持し、封口板15とケース18とをガスケット16を介してかしめることによって製造できる。なお、蓄電デバイス1における負極集電体13、負極12、セパレータ14、正極10、正極集電体11などの各部材の接触圧が十分である場合には、スペーサー17を設ける必要はない。すなわち、スペーサー17を設けるか否かは、前記各部材の接触圧などに応じて、適宜選択すればよい。

[0073] 本発明の蓄電デバイスは、たとえば、ハイブリッド自動車、各種電気・電子機器(特に移動体通信機器や、ノートPCや携帯電話などの携帯電子機器)などの電源、火力発電、風力発電、燃料電池発電などの発電平準化用の蓄電デバイス、一般家庭および集合住宅用の非常用蓄電システム、深夜電力蓄電システムなどの電源、無停電電源などとして好適に使用できる。

以下に、本発明の実施の形態として蓄電デバイスの携帯電話等への使用例を示す。

[0074] 実施の形態1

本発明の蓄電デバイスを用いた携帯電話の一例を、図10を参照しながら説明する。図10は、本発明の蓄電デバイスを電源に用いた携帯電話100の概略斜視図である。図10に示すように、携帯電話100は、液晶パネル等の表示部166および入力部168を有し、入力部168が設けられた筐体160内に、電子制御回路部(図示しない)、および電源部として本発明の蓄電デバイス150が設置されている。制御回路部は、たとえば蓄電デバイスの充電量(SOC)やパネルの表示を制御する。また、たとえば蓄電デバイスの充電時の電圧を制御する。

蓄電デバイス150として、本発明の蓄電デバイスと、従来の蓄電デバイスとを組み合わせて用いてもよい。従来の蓄電デバイスとは、例えば、リチウムイオン電池、ニッ

ケル水素蓄電池、キャパシタ、または燃料電池が挙げられる。

本発明の蓄電デバイスは小型・薄型化が可能であるため、蓄電デバイスの設置に要するスペースを小さくでき、携帯電話を小型・薄型化できる。本発明の蓄電デバイスは高速充電が可能であるため、充電時間を短縮できる。本発明の蓄電デバイスは高出力および高容量を有するため、携帯電話の連続通話時間の延長等の高性能化が可能である。

[0075] 実施の形態2

本発明の蓄電デバイスを用いたノートPCの一例を、図11を参照しながら説明する。図11は、本発明の蓄電デバイスを電源に用いたノートPC200の概略斜視図である。図11に示すように、ノートPC200は、液晶パネル等の表示部266およびキー操作部210を備えた筐体260を備え、筐体260内にCPU等を備えた電子制御回路部(図示しない)、冷却用ファン(図示しない)、および電源部として本発明の蓄電デバイス270が設置されている。

蓄電デバイス270として、本発明の蓄電デバイスと、従来の蓄電デバイスとを組み合わせて用いてもよい。従来の蓄電デバイスとは、例えば、リチウムイオン電池、ニッケル水素蓄電池、キャパシタ、または燃料電池が挙げられる。

本発明の蓄電デバイスは小型・薄型化が可能であるため、蓄電デバイスの設置に要するスペースを小さくでき、ノートPCの小型・薄型化が可能である。本発明の蓄電デバイスは高速充電が可能であるため、充電時間を短縮できる。本発明の蓄電デバイスは高出力および高容量を有するため、ノートPCの長時間の使用、または高速起動などが可能となる。

[0076] 実施の形態3

本発明の蓄電デバイスを用いたハイブリッド自動車の一例を、図12を参照しながら説明する。図12は、本発明の蓄電デバイスを用いたハイブリッド自動車300の構成を示す図である。図12に示すように、ハイブリッド自動車300は、エンジン302と、複数のモーター303、304、および305と、これらにそれぞれ接続するインバーター306、307、および308と、電力を供給する電源部として本発明の蓄電デバイス309と、システム全体を制御するコントローラー310からなる。モーター303は、エンジン302

の始動用または発車のアシスト用のモーターであり、発電機としても機能する。モーター304は車駆動用のモーターであり、モーター305は操舵（パワーステアリング）用のモーターである。蓄電デバイス309の放電（電力供給）により、モーター303が駆動してエンジン302を始動または発進をアシストし、油圧装置311に接続されたモーター305が高速駆動する。蓄電デバイス309の充電は、モーター303を発電機として用い、エンジン302の駆動力を電力に変換して行われる。

蓄電デバイス309として、本発明の蓄電デバイスと、従来の蓄電デバイスとを組み合わせて用いてもよい。従来の蓄電デバイスとは、例えば、リチウムイオン電池、ニッケル水素蓄電池、キャパシタ、または燃料電池が挙げられる。

本発明の蓄電デバイスは小型・薄型化が可能であるため、自動車の軽量化が可能となる。また、蓄電デバイスの設置に要するスペースを小さくでき、収納スペースや座席スペースをより大きく確保することが可能となる。本発明の蓄電デバイスは、高速充放電でき、高出力および高容量を有するため、種々の走行モードに対応でき、自動車の燃費向上に寄与することができる。

実施例

[0077] 以下、本発明の実施例を詳細に説明するが、本発明はこれらの実施例に限定されない。

《実施例1》

図1に示すのと同様のコイン型蓄電デバイスを、以下の手順で作製した。

（1）正極の作製

正極活物質としての活性炭粉末（比表面積1700m^2／g、数平均粒子径2μm）100mgと、電子伝導助材としてのアセチレンブラック20mgとを均一に混合した。この混合物にポリビニルピロリドン20mgおよびメタノール800mgを加えて正極合剤スラリーを調製した。この正極合剤スラリーをアルミニウム箔からなる正極集電体（厚み15μm）上に塗布した後、真空乾燥し、アルミニウム箔表面に層状の正極を形成した。この正極集電体と正極とからなる正極積層体を直径13．5mmの円盤状に打ち抜き裁断した。このとき、正極活物質の塗布重量は6．1mg／cm^2、正極厚みは45μmであった。なお、正極活物質である活性炭粉末は、フェノール樹脂系炭素材料を窒素ガ

ス中で炭化させた後、水蒸気を導入して賦活処理を施すことによって得られたものである。

また、この正極積層体を用い、かつ全く同じ構成の積層体を対極(負極)として用いて得られる電気二重層キャパシタを、単極電位0～1V(蓄電デバイスとしては0～2V)の範囲で動作(充放電)させた場合、その蓄電デバイス容量は0.08mAhであった。

[0078] (2)負極の作製

負極集電体に銅箔(比表面積11.6、算術平均表面粗さ(Ra)2.0μm、厚み43μm)を用いた。電子線加熱蒸着法により、この銅箔上に珪素酸化物(SiOx)の薄膜からなる負極(厚み6μm、比表面積4.2)を形成した。比表面積および算術平均表面粗さは、レーザー顕微鏡(商品名:超深度形状測定顕微鏡VK－855、キーエンス社製)を用いて測定した。負極集電体および負極の厚みは走査型電子顕微鏡(SEM)により測定した。負極集電体の電解質保持部の容積比率は、後述の実施例10と同様の方法により求めた。

このようにして、負極集電体と負極とからなる負極積層体を得た。負極厚みの調整は蒸着時間を調整して行った。電子線加熱蒸着の条件は次の通りである。蒸着源として、純度99.9999%の珪素金属((株)高純度化学研究所製)を用い、真空チャンバー内に純度99.7%の酸素ガス(日本酸素(株)製)を導入して真空度3×10^{-3}Paに調整した。また、蒸着源に照射する電子ビームの加速電圧を8kV、エミッションを500mAとした。負極形成後、蛍光X線分析により組成を分析した結果、負極中のSiとOとの比はSi:O＝1:0.6(モル比)であった。このことから、負極を構成する酸化珪素(SiOx)のxの値は0.6であることが判った。

[0079] 次に、上記で得られた負極の容量を、以下のようにして確認した。上記と同じ方法で作製した負極積層体を、直径13.5mmの円盤状に打ち抜き裁断したものと、リチウム金属板(厚み300μm)からなる対極とを、多孔質ポリエチレンシートからなるセパレータ(厚み20μm)を介して対向配置してコイン型蓄電デバイスを作製した。この蓄電デバイスを3回充放電した。このとき、電流値0.5mA、上限電圧1.5V、および下限電圧0Vとした。この充放電により、充放電可能な可逆容量は1.8mAh(単位面積

あたりの容量：1．3mAh/cm^2）であり、充放電に寄与しない不可逆容量は0．5mAhであることを確認した。

[0080] 上記で得られた作製直後の負極はリチウムを含まないため、完全放電状態、すなわちSOC（State of Charge）0％の状態である。負極のSOCとは、蓄電デバイス全体としてではなく、負極単体の充電状態を表す指標であり、負極単体の満充電時の容量を100％として、満充電量に対する充電量の割合を百分率で表した値である。したがって、完全に放電された状態のSOCは0％であり、満充電状態のSOCは100％である。

本実施例では、上記で得られた負極表面に厚み4．5μmのリチウム金属層を蒸着法により形成して負極のSOCを50％に調整した。ここでは、リチウム基準で0～1．5Vの電位範囲において、負極容量に対して0．2CA（5時間率）で充電させた場合の負極の充電量をSOC100％（満充電）とし、この値を基準として負極のSOCを求めた。なお、負極の表面に蒸着されたリチウム金属は、負極を電解質に浸漬しなくても負極に吸収され、負極が充電（リチウム充電）される。また、このリチウム充電量は、負極の不可逆容量に加えて、可逆容量の50％（SOC50％）まで充電される充電電気量に相当する量である。SOC50％の負極は、厚みが9μmであった。SOC調整後、負極積層体を直径13．5mmの円盤状に打ち抜き裁断した。

[0081] （3）蓄電デバイスの組み立て

電解質を含浸させた多孔質ポリエチレンシートであるセパレータ（厚み20μm）を介して、上記で得られた正極積層体と負極積層体とを対向配置し、電極体を作製した。電解質には、エチレンカーボネートとエチルメチルカーボネートとの混合溶媒（体積比1：3）に1．25mol／Lの割合で6フッ化リン酸リチウム（支持塩または電解質塩）を溶解させた非水電解液を用いた。この電極体を、正極集電体側を下側にしてケースに収容した。プレス機により、ケースの開口端部と封口板の周縁部とをガスケットを介してかしめて、ケースを封口し、図1に示す本発明のコイン型蓄電デバイスを作製した。なお、正極の厚みに応じて、蓄電デバイス内の各部材の接触圧が不十分な場合には、適切な厚みを有するスペーサーを負極集電体と封口板との間に設けた。

[0082] 《実施例2》

負極集電体に電解銅箔(比表面積11．6、算術平均表面粗さ(Ra)1．8μm、厚み43μm)を用いた。RFスパッタリングにより、この銅箔上に珪素の薄膜からなる負極(厚み1．5μm、比表面積11．4)を形成した。このようにして、負極集電体と負極とからなる負極積層体を得た。

RFスパッタリングは以下のようにして行った。直径10インチの溶融シリコンターゲット(ケイ素純度99．99%)を用い、ターゲットと基板との間の距離を7cmとし、アルゴン50sccmを導入した。真空雰囲気圧力1．1Pa、印加電力1kW、および成膜時間5時間とした。

[0083] 実施例1と同様の方法により負極容量を確認した結果、充放電が可能な可逆容量が2．1mAh(単位面積あたりの容量:1．5mAh/cm^2)であり、充放電に寄与しない不可逆容量が0．1mAhであった。

本実施例では、上記で得られた負極表面に厚み4μmのリチウム金属層を蒸着法により形成して負極のSOCを50%に調整した。なお、負極の表面に蒸着されたリチウム金属は、負極を電解質に浸漬しなくても負極に吸収され、負極が充電(リチウム充電)される。また、このリチウム充電量は、負極の不可逆容量に加えて、SOC50%まで充電される充電電気量に相当する量である。このようにして得られたSOC50%の負極は、4μmの成膜厚みを有していた。この負極と負極集電体との負極積層体を用いた以外、実施例1と同様の方法により蓄電デバイスを作製した。

[0084] 《比較例1》

負極活物質として、SiO粒子(高純度科学研究所(株)製)を用い、自動乳鉢により粒径44μm以下に粉砕整粒したものを負極活物質として用いた。この負極活物質、グラファイト(電子伝導助材)、およびポリアクリル酸(バインダー)をそれぞれ重量比45:40:15の割合で混合して負極合剤を得た。この負極合剤を、負極集電体である厚み100μmのニッケルメッシュに圧着し、厚み75μmの負極(合剤層)を形成した。

上記で得られた負極について、以下のようにして容量の確認、および電気化学的充電方法による充電処理を行った。上記で得られた負極と、リチウム金属(厚み300μm)である対極とを、多孔質ポリエチレンシートからなるセパレータ(厚み20μm)を挟んで対向させてコイン型蓄電デバイスを作製した。そして、この蓄電デバイスを3回

充放電した。このとき、電流値0．5mA、上限電圧1．5V、および下限電圧0Vとした。この充放電により、充放電が可能な可逆容量が14mAhであり、充放電に寄与しない不可逆容量が9mAhであることを確認した。可逆容量の50％（SOC50％）まで充電した後、コイン型蓄電デバイスを分解し、負極集電体と負極とからなる負極積層体を取り出した。この負極積層体を用いた以外、実施例1と同様の方法により蓄電デバイスを作製した。

[0085] 《比較例2》

負極厚みを75μmから50μmに変更する以外、比較例1と同様の方法によりニッケルメッシュ（負極集電体）表面に、バインダーを含む厚み50μmの負極を形成した。得られた負極について、比較例1と同様の方法により、容量の確認および充電処理を行った。得られた負極の充放電可能な可逆容量が9mAhであり、充放電に寄与しない不可逆容量が6mAhであることを確認した。可逆容量の50％（SOC50％）まで充電した後、コイン型蓄電デバイスを分解し、負極集電体と負極とからなる負極積層体のみ取り出した。この負極積層体を用いる以外、実施例1と同様の方法により蓄電デバイスを作製した。

[0086] 《比較例3》

比較例2と同じ負極に対し機械的充電方法により充電処理を行った。すなわち、負極上に、蒸着法により厚み38μmのLi金属層を形成した。この層は、負極の不可逆容量に加えて、負極の有する可逆容量の50％SOCまで充電することのできる電気量に相当するLi量を含む。Li蒸着後、負極表面の全面が銀色に着色しており、Liの析出が確認され、負極へのLiの充電反応は完全には起こらなかった。また、この負極と負極集電体との負極積層体を非水電解液に浸漬すると、負極が負極集電体から剥がれ、蓄電デバイスとしての評価を行うことができなかった。これは、Liの蒸着により、負極中のバインダーの劣化が起こったためと考えられる。

[0087] 実施例1～2および比較例1～2の蓄電デバイスについて、充放電容量評価を行った。なお、実施例1～2および比較例1～2の蓄電デバイスは、正極容量が0．08mAhであり、正極容量に対して十分過剰量の可逆容量を有する負極を用い、負極容量は正極容量よりも十分に大きい。したがって、これらの蓄電デバイスの理論充放電容

量は0．08mAhである。

充放電容量の評価は、0．5mA、4mA、または12mAの電流値で定電流充放電を行い、充電上限電圧3．75V、放電下限電圧2．75Vとし、充電休止時間および放電休止時間をそれぞれ1分として行った。充電休止時間とは、充電終了後、次の放電を開始するまでの時間である。放電休止時間とは、放電終了後、次の充電を開始するまでの時間である。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。その評価結果を表1に示す。

[0088] [表1]

電流値	負極	充放電容量（ｍＡｈ）		
		０．５ｍＡ	４ｍＡ	１２ｍＡ
実施例１	ＳｉＯｘ薄膜	０．０９	０．０８	０．０５
実施例２	Ｓｉ薄膜	０．０９	０．０８	０．０７
比較例１	合剤層	０．０８	０．０５	０．０１
比較例２	合剤層	０．０８	０．０６	０．０２

[0089] 表1から次のことが明らかとなった。従来の蓄電デバイスである、比較例1および2の蓄電デバイスは、電流値が0．5mAと小さい場合には、0．08mAhとほぼ理論容量が充放電できるものの、充放電時の電流値を4mA、12mAと大きくするにつれて、充放電容量の低下が見られた。特に、電流値12mAの時には、充放電電気量が極端に低下した。

これに比べて、バインダーを含まず、負極集電体上に直接形成された厚み10μｍ以下の負極を用いた実施例1および2の本発明の蓄電デバイスでは、電流値が0．5mA、4mA、12mAと大きくなっても、大部分の充放電電気量が維持できることが確認できた。すなわち、従来よりも高出力の蓄電デバイスを提供することができた。また、比較例3の有機バインダーを含んだ負極を用いている蓄電デバイスでは、予め負極に蒸着法によりリチウムを吸蔵させることができなかった。これに対して、実施例1～2の蓄電デバイスでは、組立前に蒸着法により負極にリチウムを吸蔵させることが

できるので、加工性の面でも優れていることがわかった。

[0090] 実施例1(負極厚み9μm)に比べて、実施例2(負極厚み4μm)の蓄電デバイスの方が、電流値12mAの際の放電容量が大きくなっており、より高出力な蓄電デバイスが得られた。これは、実施例2の蓄電デバイスにおける負極の厚みが4μmであり、実施例1の蓄電デバイスの負極厚みよりも薄かったためであると考えられる。したがって、負極の厚みは5μm以下が好ましいことがわかった。

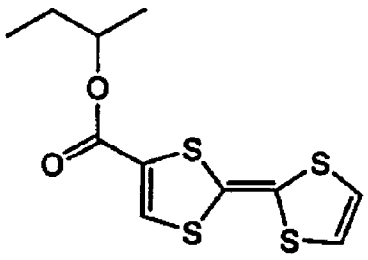
[0091] 実施例1および2の蓄電デバイスでは、動作電圧(放電下限電圧～充電上限電圧)2.75～3.75Vと高電圧での充放電が可能であることから、正極活物質および負極活物質の両方に活性炭を用いた従来の蓄電デバイスよりも高エネルギー密度化することが可能である。また、本発明の蓄電デバイスで用いる負極は厚み10μm以下の薄膜である。従って、本発明では、蓄電デバイスの高容量化と小型化とを同時に達成できる。

[0092] 《実施例3》

以下正極積層体を用いた以外、実施例1と同様の方法により蓄電デバイスを作製した。

正極を構成する正極活物質として、化学構造式(4)で表されるモノマー単位のホモポリマーであるπ共役電子雲を有する有機化合物ポリマー(以下「π共役ポリマー」とする)を用いた。このπ共役ポリマーは、ポリビニルアルコールと、テトラチアフルバレンにカルボキシル基を導入した化学構造式(5)の分子構造を有する化合物を脱水縮合させることによって合成した。このπ共役ポリマーは、数平均分子量:約15000、理論最大容量:200mAh／gであった。

[0093] [化4]



(4)

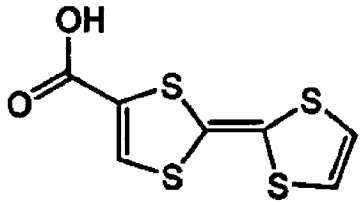
[0094] π共役ポリマー37．5mgとアセチレンブラック100mgとを均一に混合し、さらにポリテトラフルオロエチレン25mgを加えて混合し、正極合剤を調製した。この正極合剤をアルミニウム製金網からなる正極集電体上に圧着し、真空乾燥した。これを直径13．5mmの円盤状に打ち抜き裁断して、正極と正極集電体との積層体を作製した。このとき、正極活物質の塗布重量は正極単位面積あたり0．5mg／cm^2、正極厚みは90μm、正極理論容量は0．14mAhであった。

[0095] 《実施例4》

以下の正極積層体を用いた以外、実施例1と同様の方法により蓄電デバイスを作製した。

正極を構成する正極活物質として、化学構造式(6)で表されるモノマー単位のホモポリマーであるラジカルを有する有機化合物ポリマー(以下「ラジカルポリマー」とする)を用いた。このラジカルポリマーは、化学構造式(7)で表されるモノマー化合物をラジカル重合させた後、窒素原子に結合する水素原子を酸化することによって合成した。このラジカルポリマーは、数平均分子量:約100000、理論最大容量:110mAh／gであった。

[0096] [化5]



(5)

[0097] ラジカルポリマー37．5mgとアセチレンブラック100mgとを均一に混合し、さらにポリテトラフルオロエチレン25mgを加えて混合し、正極合剤を調製した。この正極合剤をアルミニウム製金網からなる正極集電体上に圧着し、真空乾燥した。これを直径13．5mmの円盤状に打ち抜き裁断して、正極と正極集電体との積層体を作製した。このとき、正極活物質の塗布重量は正極単位面積あたり0．5mg／cm^2、正極厚みは90μm、正極理論容量は0．08mAhであった。

[0098] 実施例3～4の蓄電デバイスについて、充放電容量評価を行った。充放電容量の評価は、0．5mA、4mA、または12mAの電流値で定電流充放電を行い、充電上限電圧3．75V、放電下限電圧2．75Vとし、充電休止時間および放電休止時間をそれぞれ1分として行った。充電休止時間とは、充電終了後、次の放電を開始するまでの時間である。放電休止時間とは、放電終了後、次の充電を開始するまでの時間である。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。その評価結果を表2に示す。

[0099] [表2]

電流値	充放電容量（ｍＡｈ）		
	０．５ｍＡ	４ｍＡ	１２ｍＡ
実施例３	０．１５	０．１４	０．１２
実施例４	０．０９	０．０８	０．０５

[0100] 表2から次のことが明らかとなった。実施例3および4の蓄電デバイスでは、電流値が0．5mA、4mA、12mAと大きくなっても、大部分の充放電電気量を維持できることが確認できた。すなわち、従来よりも高出力の蓄電デバイスを提供することができた。また、実施例3～4の蓄電デバイスでは、組立前に蒸着法により負極にリチウムを吸蔵できており、加工性の面でも優れていることがわかった。この結果から、酸化還元可能な有機化合物を正極活物質として用いた場合でも、高出力な蓄電デバイスが得られることを確認できた。

また、正極活物質である酸化還元可能な有機化合物は、活性炭よりもさらに高容量であり、かつ高電圧での動作を可能にすることから、一層高容量で実用性に富む蓄電デバイスが得られる。

[0101] 《実施例5》

本実施例では、負極の厚みと正極の厚みとの関係について検討した。

以下の方法により負極を作製した。

負極集電体に銅箔(比表面積11．6、表面粗さ(Ra)2．0μm、厚み43μm)を用いた。電子線加熱蒸着法により、この銅箔上に珪素酸化物(SiOx)の薄膜からなる負極(厚み6μm、比表面積4．2)を形成した。

このようにして、負極集電体と負極とからなる負極積層体を得た。負極厚みの調整は蒸着時間を調整することで行った。電子線加熱蒸着の条件は次の通りである。蒸着源として純度99．9999%のケイ素金属((株)高純度化学研究所製)を用い、真空チャンバー内に純度99．7%の酸素ガス(日本酸素(株)製)を導入して真空度3×10^{-3}Pに調整した。また、蒸着源に照射する電子ビームの加速電圧を8kVとし、エミッションを500mAとした。負極形成後、蛍光X線分析により組成を分析した結果、負極中のSiとOとのモル比率が1:0．6であった。このことから、負極を構成する酸化珪素(SiOx)のx値は0．6であることが判った。

[0102] 次に、上記で得られた負極の容量を、以下のようにして確認した。上記と同じ方法で作製した負極積層体を、直径13．5mmの円盤状に打ち抜き裁断したものと、リチウム金属(厚み300μm)からなる対極とを、多孔質ポリエチレンシートからなるセパレータ(厚み20μm)を介して対向配置してコイン型蓄電デバイスを作製した。この蓄電デバイスを3回充放電した。このとき、電流値0．5mA、上限電圧1．5V、および下限電圧0Vとした。この充放電により、充放電可能な可逆容量が1．8mAh(単位面積あたり容量1．3mAh／cm^2)であり、充放電に寄与しない不可逆容量が0．5mAhであることを確認した。

[0103] 最後に、以下のようにして、負極のSOCを調整した。すなわち、負極に対して機械的充電を行い、次に、電気化学的充電により負極のSOCを微調整した。具体的には、上記で得られた負極積層体における負極表面に、不可逆容量(0．5mAh)に相当する厚み2．6μmのリチウム金属を蒸着法により形成した。なお、負極の表面に蒸着されたリチウムは、負極を電解質に浸漬しなくても負極に吸収され、負極において不可逆容量分が充電された。さらに、機械的充電後の負極積層体を直径13．5mmの円盤状に打ち抜き裁断したものと、リチウム金属(厚み300μm)からなる対極とを、セパレータを挟んで対向させてコイン型蓄電デバイスを作製した。そして、負極のSOC

が50％（充電電気量0．05mAh）となるまで、0．5mAの定電流で充電した。なお、セパレータおよび電解質には、実施例1と同じものを用いた。

このようにして、負極のSOCが50％となるまで充電した後、コイン型蓄電デバイスを分解し、SOCが50％の負極を得た。このとき得られた負極の厚みは9μmであった。

[0104] 蓄電デバイス構成時の正極の単位面積あたりの活物質重量、および電極容量を実施例1と同じ値とし、正極の厚みを表3に示す値に変えた以外は、実施例1と同様の方法により正極積層体（A－1）～（A－7）を作製した。

なお、正極の厚み45、60、70、100、125、30、および35μmは、活性炭粉末（比表面積1700m^2／g、平均粒子径2μm）100mgに対する、電子伝導助材としてのアセチレンブラックの配合割合を、それぞれ20、30、35、50、62、15、および18mgに変えることにより調整した。

そして、上記で得られた負極積層体および正極積層体（A－1）～（A－7）を用いて、実施例1と同様の方法により蓄電デバイス（A－1）～（A－7）を作製した。

[0105] 蓄電デバイス（A－1）～（A－7）について、充放電容量評価を行った。

充放電容量の評価は、4mAまたは12mAの定電流充放電で、充電上限電圧3．75V、放電下限電圧2．75Vとし、充電終了後、次の放電を開始するまでの充電休止時間、および、放電終了後、次の充電を開始するまでの放電休止時間は、それぞれ1分間とした。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。

これらの評価結果を表1に示す。同様に表1中に、各蓄電デバイスに用いた正極と負極の厚み、およびその比率を記載した。

[0106] [表3]

蓄電デバイス（正極積層体）No.	負極の厚み（μm）	正極の厚み（μm）	充放電容量（mAh）		厚み比（正極／負極）
			電流値 4mA	電流値 12mA	
A-1	9	45	0.08	0.04	5.0
A-2	9	60	0.08	0.04	6.7
A-3	9	70	0.08	0.04	7.8
A-4	9	100	0.08	0.06	11.1
A-5	9	125	0.08	0.06	13.9
A-6	9	30	0.05	0.01	3.3
A-7	9	35	0.06	0.02	4.0

[0107] 表3に示すように、電流値4mAで蓄電デバイスを充放電した場合、正極の厚みが負極の厚みの5倍以上である蓄電デバイス(A－1)～(A－5)では、正極の厚みが負極の厚みの5倍未満である蓄電デバイス(A－6)および(A－7)と比べて0.08mAhの高い容量が得られた。

以上のことから、正極の厚みが負極の厚みの5倍以上であることが好ましいことがわかった。なお、蓄電デバイス(A－1)～(A－7)は、正極容量が0.08mAhであり、負極容量が正極容量に対して十分過剰量の可逆容量を有しているため、理論充放電容量は0.08mAhである。

[0108] また、電流値12mAで蓄電デバイスを充放電した場合、正極の厚みが負極の厚みの10倍以上を有する蓄電デバイス(A－4)および(A－5)では、正極の厚みが負極の厚みの10倍未満の蓄電デバイス(A－1)～(A－3)、(A－6)および(A－7)に比べて高容量が得られることがわかった。

大電流で充放電した場合でも高容量が得られるということは、高容量を有し、かつ出力特性に優れた蓄電デバイスであるということを意味している。すなわち、蓄電デバイス内部に十分量のアニオンおよびカチオンを保持させることができるため、イオンの伝導性、および拡散性に優れた蓄電デバイスを提供することができると考えられる。

以上のことから、正極の厚みが負極の厚みの10倍以上であることがより好ましいこと

がわかった。

[0109] 《実施例6》

本実施例では、負極の比表面積について検討した。

下記の負極積層体(B－1)～(B－3)を用いて、実施例1と同様の方法により、蓄電デバイス(B－1)～(B－3)を作製した。

負極積層体(B－1)は以下の方法により作製した。

負極集電体には、電解銅箔(比表面積11．6、算術平均表面粗さ(Ra)1．8μm、厚み43μm)を用いた。この銅箔上に、RFスパッタリングにより、珪素の薄膜からなる負極を形成した。このようにして、負極集電体および負極からなる負極積層体を得た。

RFスパッタリングは、以下のようにして行った。直径10インチの溶融シリコンターゲット(珪素純度99%)を用い、ターゲットと基板との間の距離を7cmとし、アルゴンを50sccmで導入した。真空雰囲気圧力1．1Pa、印加電力1kw、および成膜時間1時間とした。

[0110] 得られた負極を走査型電子顕微鏡(SEM)により観察した結果、負極は厚み0．3μmの薄膜であった。図13は負極集電体53の厚み方向断面の顕微鏡写真である。図14は負極52と負極集電体53との積層体の厚み方向断面の顕微鏡写真である。図14から、負極集電体53である電解銅箔の表面(上面)に、該電解銅箔表面の凹凸に追従するように、負極52である薄膜が形成されることが明らかである。また、負極52表面の比表面積は11．4であった。負極52は、その表面が負極集電体53表面の凹凸をほぼ正確に再現するので、負極集電体53表面の比表面積に近い値が得られた。

[0111] 次に、上記で得られた負極の容量を、以下のようにして確認した。上記と同様にして作製された負極積層体を直径13．5mmの円盤状に打ち抜き裁断したものと、リチウム金属板(厚み300μm)からなる対極とを、多孔質ポリエチレンシートからなるセパレータ(厚み20μm)を介して対向配置させてコイン型蓄電デバイスを作製した。この蓄電デバイスを3回充放電した。このとき、電流値0．1mA、上限電圧1．5V、および下限電圧0Vとした。この充放電により、充放電可能な可逆容量が0．44mAh／cm^2

であり、充放電に寄与しない不可逆容量が0．03mAh／cm^2であることを確認した。

[0112] 次に、負極のSOCを50％に調整した。すなわち、蒸着法により、厚み1．3μmのリチウム金属層を負極表面に形成した。これを直径13．5mmの円盤状に打ち抜き裁断してリチウム金属、負極および負極集電体の積層体を形成した。なお、負極の表面に蒸着されたリチウム金属は、負極を電解質に浸漬しなくても負極に吸収され、負極が充電（リチウム充電）される。また、このリチウム充電量は、負極の不可逆容量に加えて、SOC50％まで充電される充電電気量に相当する量である。SOC調整後の負極厚みは0．6μmであった。

[0113] 負極積層体（B－2）は、以下の方法により作製した。

負極集電体には、圧延銅箔（比表面積7．0、算術平均表面粗さ（Ra）1．24μm、厚み15μm）を用いた。この銅箔上に、上記と同じ条件でRFスパッタリングし、珪素の薄膜からなる負極を形成した。このようにして、負極集電体および負極からなる負極積層体を得た。

得られた負極を走査型電子顕微鏡（SEM）により観察した結果、負極は厚み0．7μmの薄膜であった。負極表面の比表面積は7．1であった。負極の表面には、負極集電体表面の凹凸がほぼ正確に再現されているので、負極集電体表面の比表面積に近い値が得られた。

[0114] また、負極の容量を上記と同様の方法により確認したところ、充放電可能な可逆容量が0．53mAh／cm^2であり、充放電に寄与しない不可逆容量が0．04mAh／cm^2であることを確認した。

次に、蒸着法により、負極表面に厚み1．6μmのリチウム金属層を形成した。これによって、負極のSOCを50％に調整した。SOC調整後の負極厚みは1．4μmであった。

[0115] 負極積層体（B－3）は、以下の方法により作製した。

負極集電体には、圧延銅箔（比表面積1．0、算術平均表面粗さ（Ra）0．12μm、厚み15μm）を用いた。この銅箔上に、上記と同じ条件でRFスパッタリングし、珪素の薄膜からなる負極を形成した。このようにして、負極集電体および負極からなる負極積層体を得た。

得られた負極を走査型電子顕微鏡(SEM)により観察した結果、負極は厚み0．7μmの薄膜であった。図15は負極集電体62の厚み方向断面の顕微鏡写真である。図16は負極61と負極集電体62との積層体の厚み方向断面の顕微鏡写真である。図16から、負極集電体62である圧延銅箔の表面に、該圧延銅箔表面の凹凸に追従するように、負極61である薄膜が形成されることが明らかである。また、負極61表面の比表面積は1．1であった。負極61は、その表面が負極集電体62表面の凹凸をほぼ正確に再現するので、負極集電体62表面の比表面積に近い値が得られた。

[0116] また、負極の容量を上記と同様の方法により確認したところ、充放電可能な可逆容量が0．53mAh／cm^2であり、充放電に寄与しない不可逆容量が0．04mAh／cm^2であることを確認した。

次に、蒸着法により、負極表面に厚み1．6μmのリチウム金属層を形成した。これによって、負極のSOCを50%に調整した。SOC調整後の負極厚みは1．4μmであった。

[0117] 蓄電デバイス(B－1)～(B－3)について、充放電容量評価を行った。蓄電デバイス(B－1)～(B－3)は、正極容量が0．08mAhであり、正極容量に対して十分過剰量の可逆容量を有する負極を用い、負極容量は正極容量よりも十分に大きい。従って、これらの蓄電デバイスの理論充放電容量は0．08mAhである。

充放電容量の評価は、0．6mA、1．8mA、または3mAの定電流充放電で、充電上限電圧3．75V、放電下限電圧2．75Vとし、充電休止時間および放電休止時間をそれぞれ1分として行った。充電休止時間とは、充電終了後、次の放電を開始するまでの時間である。放電休止時間とは、放電終了後、次の充電を開始するまでの時間である。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。結果を表4に示す。なお、表4には、各蓄電デバイスにおける負極の比表面積を併記する。

[0118] [表4]

蓄電デバイス（負極積層体）No.	充放電容量（mAh）			負極比表面積
	電流値 0．6mA	電流値 1．8mA	電流値 3mA	
B－1	0．08	0．08	0．07	11．4
B－2	0．08	0．08	0．06	7．1
B－3	0．08	0．06	0．03	1．1

[0119] 表4に示すように、充放電時の電流値0．6mAの場合、蓄電デバイス(B－1)～(B－3)のいずれにおいても、設計容量である0．08mAhの容量が得られた。また、充放電時の電流値が1．8mAまたは3mAと大きい場合でも、蓄電デバイス(B－1)および(B－2)は、ほぼ設計容量通りの良好な容量を示した。特に、蓄電デバイス(B－1)は、蓄電デバイス(B－2)に比べて、3mAという大電流においてより良好な特性を示した。

このように、蓄電デバイス(B－1)および(B－2)では、3mAという大電流で充放電した場合でも高容量が得られることは、これらの蓄電デバイスが高容量でありかつ出力特性に優れることを意味する。

[0120] 各蓄電デバイスのインピーダンスを測定したところ、蓄電デバイス(B－3)の抵抗値は蓄電デバイス(B－1)の抵抗値よりも30オームも大きい値であった。蓄電デバイス(B－1)は、負極以外は蓄電デバイス(B－3)と全く同じ構成であることから、負極の比表面積を大きくすることによって、蓄電デバイスのインピーダンスが低下することが確認された。

[0121] 以上の結果から、材料あたりのエネルギー量が非常に大きい負極活物質である特定の非炭素材料を含み、かつ厚み10μm以下の薄膜負極を用いる場合には、負極の比表面積は5以上が好ましいことがわかった。これにより、高容量で出力特性に優れた蓄電デバイス、すなわち高容量キャパシタが得られることがわかった。さらに、蓄電デバイスの出力特性が大幅に向上するため、負極の比表面積は10以上がより好ましいことがわかった。

[0122] 《実施例7》

正極活物質に上記π共役ポリマーを用いた実施例3と同じ正極積層体を用いる以外、実施例6の蓄電デバイス(B－1)と同様に蓄電デバイス(B－4)を作製した。

また、正極活物質に上記ラジカルポリマーを用いた実施例4と同じ正極積層体を用いる以外、実施例6の蓄電デバイス(B－1)と同様に蓄電デバイス(B－5)を作製した。

[0123] 蓄電デバイス(B－4)および(B－5)について、充放電容量評価を行った。充放電容量の評価は、充放電電流値4mA、充電上限電圧4．2V、放電下限電圧2．75Vとし、充電休止時間および放電休止時間をそれぞれ1分として行った。充電休止時間とは、充電終了後、次の放電を開始するまでの時間である。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。

得られた充放電容量は、蓄電デバイス(B－4)では0．14mAh、蓄電デバイス(B－5)では0．08mAhであり、設計容量通りの高容量を得ることができた。すなわち、いずれの場合においても、正極活物質に活性炭を用いた場合と同様に、高容量を有し、かつ出力特性に優れる蓄電デバイスが得られた。また、正極活物質である酸化還元可能な有機化合物は、活性炭に比べて高容量であり、かつ高電圧での動作を可能にすることから、一層高容量で実用性に富む蓄電デバイスが得られた。

[0124] 《実施例8》

本実施例では、蓄電デバイス構成時の負極のSOCについて検討した。

負極集電体に、銅箔(算術平均表面粗さRa＝2．0μm、厚み43μm、比表面積1 1．6)を用いた。電子線加熱蒸着法により、この銅箔上に珪素酸化物(SiOx)の薄膜からなる負極(厚み7μm、比表面積4．0)を形成した。このようにして、負極集電体および負極からなる負極積層体を得た。負極厚みの調整は蒸着時間を調整することで行った。電子線加熱蒸着の条件は次の通りである。蒸着源として、純度99．9999％の珪素金属((株)高純度化学研究所製)を用い、真空チャンバー内に純度99．7％の酸素ガス(日本酸素(株)製)を導入して真空度3×10^{-3}Paに調整した。また、蒸着源に照射する電子ビームの加速電圧を8kV、エミッションを500mAとした。負極形成後、蛍光X線分析により組成を分析した結果、負極中のSiとOとの比はSi:O＝1:0．6(モル比)であった。このことから、負極を構成する酸化珪素(SiOx)のxの値

は0．6であることが判った。

[0125] 次に、上記で得られた負極の容量を、以下のようにして確認した。上記と同じ方法で作製した負極積層体を、直径13．5mmの円盤状に打ち抜き裁断したものと、リチウム金属板（厚み300μm）からなる対極とを、多孔質ポリエチレンシートからなるセパレータ（厚み20μm）を介して対向配置してコイン型蓄電デバイスを作製した。この蓄電デバイスを3回充放電した。このとき、電流値0．5mA、上限電圧1．5V、および下限電圧0Vとした。この充放電により、充放電可能な可逆容量は2．1mAh（単位面積あたりの負極容量：1．5mAh／cm^2）であり、充放電に寄与しない不可逆容量は0．5mAhであることを確認した。

[0126] 本実施例では、負極に対して機械的充電を行い、ついで電気化学的充電により負極のSOCを調整した。負極SOCは実施例1と同様の方法により求めた。

具体的には、上記で得られた負極積層体における負極表面に、不可逆容量（0．6mAh）に相当する厚み3μmのリチウム金属層を蒸着法により形成した。なお、負極の表面に蒸着されたリチウム金属は、負極を電解質に浸漬しなくても負極に吸収され、負極において不可逆容量分が充電（リチウム充電）された。

さらに、機械的充電後の負極積層体を直径13．5mmの円盤状に打ち抜き裁断したものと、リチウム金属板（厚み300μm）からなる対極とを、セパレータを挟んで対向させてコイン型蓄電デバイスを作製した。

[0127] そして、負極のSOCが表5に示す値となるように、0．5mAの定電流で所定時間充電した。具体的には、充電時間を調整して、負極のSOCを20％、40％、50％、70％、80％、90％、0％、または10％と変えて、それぞれ負極（C－1）～（C－8）を得た。なお、負極SOCを20％、40％、50％、70％、80％、90％、0％、または10％とするための充電電気量は、それぞれ0．42mAh、0．84mAh、1．05mAh、1．47mAh、1．68mAh、1．89mAh、0mAh、または0．21mAhであった。また、上記SOC調整後の負極（C－1）～（C－8）の厚みは、それぞれ6．8μm、7．6μm、8．1μm、8．7μm、9．2μm、9．6μm、6．0μm、および6．5μmであり、いずれも10μm以下であった。なお、セパレータおよび電解質には、実施例1の蓄電デバイスと同じものを用いた。

[0128] また、SOCの調整をしない(負極に対して機械的充電および電気化学的充電をしない)負極(厚み7μm)を含む負極積層体を用いた以外、実施例1と同様の方法により蓄電デバイス(C－9)を作製した。なお、この負極は、可逆容量の30%に相当する不可逆容量分の充電処理を行っていないため、蓄電デバイス構成時の負極のSOCを便宜上－30%とした。

上記負極積層体(C－1)～(C－9)を用いる以外、実施例1と同様の方法により、蓄電デバイス(C－1)～(C－9)を作製した。

[0129] 蓄電デバイス(C－1)～(C－9)について、充放電容量の評価およびインピーダンス評価を行った。

充放電容量の評価は、4mAの電流値で定電流充放電を行い、充電上限電圧3．75V、放電下限電圧2．75Vとし、充電休止時間および放電休止時間をそれぞれ1分として行った。充電休止時間とは、充電終了後、次の放電を開始するまでの時間である。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。

[0130] また、インピーダンス評価は、交流インピーダンス法を用い、充放電容量評価終了後の放電状態で行った。測定条件は、開回路電圧から振幅10mV、周波数範囲10^6～0．1Hzで行い、周波数10Hzのインピーダンス値を読み取った。

なお、ここでいう蓄電デバイスのインピーダンスとは、蓄電デバイスの出力特性を知ることのできる指標である。たとえば蓄電デバイスのインピーダンスが小さい場合、蓄電デバイスは低抵抗であり、高出力特性を有することを意味し、インピーダンスが大きい場合、蓄電デバイスは高抵抗であり、高出力特性を有しないことを意味する。

上記評価結果を表5に示す。なお、表5には、デバイス構成時(作製直後の放電時)の負極SOC(%)、およびデバイス充電時の負極のSOC(%)も示す。

[0131] [表5]

蓄電デバイス（負極）No.	蓄電デバイス構成時（放電時）の負極ＳＯＣ（%）	蓄電デバイス充電時の負極ＳＯＣ（%）	蓄電デバイスの充放電容量（ｍＡｈ）	蓄電デバイスのインピーダンス（Ω）
Ｃ－１	２０	２４	０．０９	５．０
Ｃ－２	４０	４５	０．１０	４．４
Ｃ－３	５０	５５	０．１０	４．４
Ｃ－４	７０	７５	０．１０	４．８
Ｃ－５	８０	８５	０．１０	５．１
Ｃ－６	９０	９５	０．１０	６．２
Ｃ－７	０	４	０．０８	５２．８
Ｃ－８	１０	１４	０．０９	１０．０
Ｃ－９	－３０	—	０	—

[0132] 表5に示すように、蓄電デバイス(C－1)～(C－8)は、0．08～0．10mAhの充放電容量を示し、蓄電デバイスとしての動作を確認することができた。この蓄電デバイスの充放電時の電圧は2．75～3．75Vであり、およそ3V以上と、従来の電気二重層キャパシタに比べて高電圧が得られた。すなわち、高電圧で動作可能な、高容量を有する蓄電デバイスが得られた。

蓄電デバイス(C－9)では充放電容量が得られなかったが、これは、負極の不可逆容量に起因すると思われる。つまり、作製直後の充電電気量の一部が、負極の不可逆容量として消費され、放電することができなかったためと思われる。なお、蓄電デバイス(C－1)～(C－8)では、いずれも負極のSOC調整過程において、負極の不可逆容量分を予め充電する処理を行ったため、良好な充放電容量が得られた。

[0133] また、蓄電デバイスにおける負極の可逆容量が2．1mAhであったことから、負極活物質の利用率は4～5%、すなわち蓄電デバイスにおいて充電時と放電時の負極SOCの差は4～5%であった。このことから、蓄電デバイスに用いる負極SOCが0～95%である場合に、動作電圧2．75～3．75Vと、およそ3V以上の電圧で動作する、高容量の蓄電デバイスが得られることがわかった。

また、表5の結果より、蓄電デバイスのインピーダンスは負極のSOCに大きく依存していることがわかった。充放電時の負極SOCが20～95%である蓄電デバイス(C－1)～(C－6)では、インピーダンスが6．2Ω以下に低下した。これに対して、負極のSOCが20%以下である蓄電デバイス(C－7)および(C－8)では、インピーダンスが

10Ω以上と増大した。この結果から、蓄電デバイスの負極のSOCが20～95%である場合、インピーダンスが小さく、高出力な蓄電デバイスが得られることがわかった。なお、充放電容量の確認できなかった蓄電デバイス(C－9)に関しては、インピーダンス測定は行わなかった。

[0134] 次に、蓄電デバイス(C－1)、(C－3)、(C－6)、および(C－8)を用いて、充放電繰り返し試験を行った。充放電条件は、充放電電流4mA、充電上限電圧3．75V、および放電下限電圧2．75Vとした。また、充電終了後、次の放電を開始するまでの充電休止時間および、放電終了後、次の充電を開始するまでの放電休止時間は、それぞれ1分とした。このような充放電を500回繰り返した。この充放電試験を6回、すなわち合計サイクル数が3000回まで試験を繰り返した。

上記の繰り返し試験において、充放電を500回繰り返す毎に、充放電電流値を0．5mAとした以外、上記と同様の条件で3回充放電を行い、3回目の放電容量を求めた。

[0135] この繰り返し試験の結果を図17に示す。図17中の容量維持率は、初回の放電容量に対する各サイクル時で求められた放電容量の比を百分率で表したものである。図17から、蓄電デバイスの充放電繰り返し特性は、蓄電デバイスの負極SOCに大きく依存していることがわかった。具体的には、充放電時の負極SOCが20～95%の範囲内である蓄電デバイス(C－1)、(C－3)および(C－6)では、繰り返し回数が3000回の時点で、容量維持率が50%以上であるのに対し、充放電時の負極SOCが10%である蓄電デバイス(C－8)では、繰り返し回数が3000回の時点で、容量維持率が20%に低下し、繰り返し特性が低下することがわかった。

以上の結果から、高容量を有し、かつ出力特性および充放電繰り返し特性に優れた蓄電デバイスが得られるため、蓄電デバイスの充放電時における負極のSOCは20～95%が好ましいことがわかった。

[0136] 《実施例9》

正極活物質に上記π共役ポリマーを用いた実施例3と同じ正極積層体を用いる以外、実施例11の蓄電デバイス(C－3)と同様にして、蓄電デバイス(C－10)を作製した。

また、正極活物質に上記ラジカルポリマーを用いた実施例4と同じ正極積層体を用いる以外、実施例11の蓄電デバイス(C－3)と同様にして、蓄電デバイス(C－11)を作製した。

[0137] 蓄電デバイス(C－10)および(C－11)について、以下のように充放電容量評価を行った。充放電条件は、充放電電流値4mA、充電上限電圧4．2V、および放電下限電圧2．75Vとし、充電終了後、次の放電を開始するまでの充電休止時間および、放電終了後、次の充電を開始するまでの放電休止時間は、それぞれ1分とした。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。その評価結果を蓄電デバイス(C－3)の結果とともに表6に示す。

[0138] [表6]

蓄電デバイスNo.	蓄電デバイス構成時（放電時）の負極ＳＯＣ（%）	蓄電デバイス充電時の負極ＳＯＣ（%）	蓄電デバイスの充放電容量（ｍＡｈ）
Ｃ－３	５０	５５	０．１０
Ｃ－１０	５０	７０	０．４０
Ｃ－１１	５０	６０	０．２２

[0139] 蓄電デバイス(C－10)および(C－11)では、蓄電デバイス(C－3)よりも高容量が得られた。これらの蓄電デバイスでは、充放電時の電圧が2．75～4．2Vと、およそ3V以上であり、高電圧で動作することがわかった。

蓄電デバイス(C－10)および(C－11)では、正極活物質に活性炭を用いた場合と同様に、高容量、かつ優れた出力特性および充放電繰り返し特性が得られた。なお、蓄電デバイス(C－10)および(C－11)では、負極SOCが50～70%の範囲で充放電を行ったが、負極SOCが20～95%の範囲内であれば、上記と同様の結果が得られる。

[0140] 《実施例10》

本実施例では、負極集電体の形態について検討した。

層状の負極集電体上に、電子線加熱蒸着法により、酸化珪素(SiOx)の薄膜からなる負極(厚み3．0μm)を形成した。負極厚みの調整は蒸着時間を調整することで行った。電子線加熱蒸着の条件は次の通りである。蒸着源として、純度99．9999%

の珪素金属((株)高純度化学研究所製)を用い、真空チャンバー内に純度99.7%の酸素ガス(日本酸素(株)製)を導入して真空度3×10^{-3}Paに調整した。また、蒸着源に照射する電子ビームの加速電圧を8kV、エミッションを500mAとした。負極形成後、蛍光X線分析により組成を分析した結果、負極中のSiとOとの比が、Si:O=1:0.6(モル比)であった。このことから、負極を構成する酸化珪素(SiOx)のxの値は0.6であることが判った。

[0141] 次に、上記で得られた負極の容量を、以下のようにして確認した。上記と同様にして作製された負極と、リチウム金属(厚み300μm)である対極とを、多孔質ポリエチレンシートからなるセパレータ(厚み20μm)を介して対向配置してコイン型蓄電デバイスを作製した。この蓄電デバイスを3回充放電した。このとき、電流値0.1mA、上限電圧1.5V、および下限電圧0Vとした。この充放電によれば、充放電可能な可逆容量は0.72mAh/cm^2であり、充放電に寄与しない不可逆容量は0.22mAh/cm^2であった。

[0142] 上記で得られた負極は、作製直後の負極中の負極活物質がリチウムを含まないため、完全放電状態、すなわちSOCが0%の状態である。負極のSOCとは、蓄電デバイス全体としてではなく、負極単体の充電状態を表す指標であり、負極単体の満充電時の容量を100%として、満充電量に対する充電量の割合を百分率で表した値である。したがって、完全に放電された状態のSOCは0%であり、満充電状態のSOCは100%である。なお、負極活物質のSOCは、以下の方法により求められる。リチウム基準で0~1.5Vの電位範囲において、負極容量に対して0.2CA(5時間率)で充電させた場合の負極の充電量をSOCが100%(満充電)であると定義し、この充電量を基準としてSOCの値を求めることができる。

[0143] 本実施例では、上記で得られた負極表面に厚み3.0μmのリチウム金属層を蒸着法により形成して負極のSOCを50%に調整した。なお、負極の表面に蒸着されたリチウム金属は、負極を電解質に浸漬しなくても負極に吸収され、負極が充電(リチウム充電)される。また、このリチウム充電量は、負極の不可逆容量に加えて、SOC50%まで充電される充電電気量に相当する量である。このようにして得られたSOC50%の負極は、4.5μmの成膜厚みを有していた。

[0144] 上記の負極積層体を用いた以外、実施例1と同様の方法により蓄電デバイスを作製した。そして、上記の負極積層体作製時において、以下の各種負極集電体(D－1)～(D－7)を用いた。

負極集電体(D－1)には、表面に突起を有する銅箔(比表面積1．4)を用いた。この負極集電体は、圧延銅箔をパターンめっきすることにより作製した。パターンめっきは、厚み20μmの圧延銅箔上にネガ型フォトレジストを塗布し、10μm角のパターンが銅箔表面の92%を占有するように配置されたネガ型マスクを用いて、銅箔上のレジストフィルムを露光、現像し、形成された溝に電解法により銅粒子を析出させ、その後レジストを除去し、台形形状を有する突起を表面に有する銅箔を得た。

[0145] ここで、図18は、負極集電体(D－1)である負極集電体70の厚み方向断面における要部の走査型電子顕微鏡(SEM)写真である。負極集電体70は、圧延銅箔である集電膜71と、集電膜71の表面に形成される複数の突起72とを含む。突起72は、集電膜71の厚み方向両面に形成した。突起72の厚み方向断面形状は擬台形状であり、突起72の高さは15μmであった。また、突起72も含めた負極集電体70の厚みは50μm、突起72の集電膜71表面における占有面積は8%であり、負極集電体70の占有体積に対する電解質保持部の容積比率は55%であった。ここで、突起72の占有面積とは、負極集電体70表面の面積に対する、負極集電体70表面における突起72が形成された部分の総面積の割合である。

突起72の高さおよび負極集電体70の厚みは集電体の断面電子顕微鏡観察により測定した。また、突起72の集電体71表面における占有面積は、集電体の表面電子顕微鏡観察により測定した。これらの値を用いて負極集電体70の占有体積に対する電解質保持部の容積比率を計算により算出した。

[0146] 負極集電体(D－2)には、厚み方向の両面に複数の突起を有する銅箔(比表面積1．4)を用いた。この負極集電体は圧延銅箔をパターンめっきすることにより作製した。パターンめっきは、厚み20μmの圧延銅箔上にネガ型フォトレジストを塗布し、10μm角のパターンが銅箔表面の85%を占有するように配置されたネガ型マスクを用いて、銅箔上のレジストフィルムを露光、現像し、形成された溝に電解法により銅粒子を析出させ、その後レジストを除去し、台形形状を有する突起を表面に有する銅箔を

得た。突起の厚み方向断面形状は擬台形状であり、突起の高さは15μmであった。また、突起も含めた負極集電体の厚みは50μm、突起の集電膜表面における占有面積は15%であり、負極集電体の占有体積に対する電解質保持部の容積比率は51%であった。

[0147] 負極集電体(D－3)には、厚み方向の両面に複数の突起を有する銅箔(比表面積1．4)を用いた。この負極集電体は圧延銅箔をパターンめっきすることにより作製した。パターンめっきは、厚み18μmの圧延銅箔上にネガ型フォトレジストを塗布し、10μm角のパターンが銅箔表面の85%を占有するように配置されたネガ型マスクを用いて、銅箔上のレジストフィルムを露光、現像し、形成された溝に電解法により銅粒子を析出させ、その後レジストを除去し、台形形状を有する突起を表面に有する銅箔を得た。突起の厚み方向断面形状は擬台形状であり、突起の高さは12μmであった。また、突起も含めた負極集電体の厚みは42μm、突起の集電膜表面における占有面積は15%であり、負極集電体の占有体積に対する電解質保持部の容積比率は49%であった。

[0148] 負極集電体(D－4)には、厚み方向の両面に複数の突起を有する銅箔(比表面積1．4)を用いた。この負極集電体は圧延銅箔をパターンめっきすることにより作製した。パターンめっきは、厚み22μmの圧延銅箔上にネガ型フォトレジストを塗布し、10μm角のパターンが銅箔表面の92%を占有するように配置されたネガ型マスクを用いて、銅箔上のレジストフィルムを露光、現像し、形成された溝に電解法により銅粒子を析出させ、その後レジストを除去し、台形形状を有する突起を表面に有する銅箔を得た。突起の厚み方向断面形状は擬台形状であり、突起の高さは10μmであった。また、突起も含めた負極集電体の厚みは42μm、突起の集電膜表面における占有面積は8%であり、負極集電体の占有体積に対する電解質保持部の容積比率は44%であった。

[0149] 負極集電体(D－5)には、銅からなる発泡金属(厚み200μm、平均孔径100μm、気孔率(負極集電体占有体積に対する電解質保持部容積比率)80%、三菱マテリアル(株)製)を用いた。

[0150] 負極集電体(D－6)には、平滑な表面を有する圧延銅箔(算術平均表面粗さ(Ra)

0．12μm、厚み25μm、比表面積1．0)を用いた。ここで、図19は、負極集電体(D－6)である負極集電体75の厚み方向断面における要部の走査型電子顕微鏡(SEM)写真である。負極集電体75は、厚み方向表面に突起を有さず、また、厚み方向に貫通する貫通孔をも有さない。したがって、負極集電体75の集電体占有体積に対する電解質保持部容積は0%である。なお、極集電体(D－6)を用いた場合の負極の比表面積は1．1であった。

[0151] 負極集電体(D－7)には、厚み方向の両面に複数の突起を有する銅箔(比表面積1．4)を用いた。この負極集電体は圧延銅箔をパターンめっきすることにより作製した。パターンめっきは、厚み26μmの圧延銅箔上にネガ型フォトレジストを塗布し、10μm角のパターンが銅箔表面の70%を占有するように配置されたネガ型マスクを用いて、銅箔上のレジストフィルムを露光、現像し、形成された溝に電解法により銅粒子を析出させ、その後レジストを除去し、台形形状を有する突起を表面に有する銅箔を得た。突起の厚み方向断面形状は擬台形状であり、突起の高さは8μmであった。また、突起も含めた負極集電体の厚みは42μm、突起の集電膜表面における占有面積は30%であり、負極集電体の占有体積に対する電解質保持部の容積比率は27%であった。

上記負極集電体(D－1)～(D－7)を用いて、それぞれ蓄電デバイス(D－1)～(D－7)を作製した。

[0152] 蓄電デバイス(D－1)～(D－7)について、充放電容量評価を行った。なお、蓄電デバイス(D－1)～(D－7)は、正極容量が0．08mAhであり、正極容量に対して十分過剰量の可逆容量を有する負極を用い、負極容量は正極容量よりも十分に大きい。したがって、これらの蓄電デバイスの理論充放電容量は0．08mAhである。

充放電容量の評価は、4mAの定電流充放電で、充電上限電圧3．75V、放電下限電圧2．75Vとし、充電休止時間および放電休止時間をそれぞれ1分として行った。充電休止時間とは、充電終了後、次の放電を開始するまでの時間である。放電休止時間とは、放電終了後、次の充電を開始するまでの時間である。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。評価結果を表7に示す。なお、表7には、各蓄電デバイスにおける負極集電体の特性、負極集電体における突起高さま

たは貫通孔径と負極成膜厚み(4．5μm)との比(突起高さ／負極成膜厚み、貫通孔径／負極成膜厚み)を併記する。

[0153] [表7]

蓄電デバイス(負極集電体)No.	充放電容量(mAh)	負極集電体・特性				突起高さ／負極成膜厚み	貫通孔径／負極成膜厚み
		電解質保持部容量比率(%)	厚み(μm)	突起高さ(μm)	貫通孔孔径(μm)		
D－1	0．08	55	50	15	－	3．3	－
D－2	0．08	51	50	15	－	3．3	－
D－3	0．08	49	42	12	－	2．7	－
D－4	0．08	44	42	10	－	2．2	－
D－5	0．08	80	200	－	100	－	22．2
D－6	0．05	0	25	－	－	－	－
D－7	0．06	27	42	8	－	1．8	－

[0154] 表面に突起を有する負極集電体を用いた蓄電デバイス(D－1)～(D－4)では、負極集電体の占有体積に対する電解質保持部の容積比率が44～55%と高く、負極集電体表面に電解質を保持できた。このため、蓄電デバイス(D－1)～(D－4)は、設計値通りの高容量の放電容量が得られた。

厚み方向に貫通孔を有する多孔質膜からなる負極集電体(D－5)を用いた蓄電デバイス(D－5)においても、負極集電体による電解質保持効果が十分に発現され、高容量が得られた。負極集電体(D－5)は、表7中の各負極集電体のなかでも、負極集電体の占有体積に対する電解質保持部の容積比率(気孔率)が80%と最も高く、電解質保持特性に最も優れていることがわかった。

[0155] 平滑表面を有する無孔質銅箔を負極集電体として用いた蓄電デバイス(D－6)では、負極集電体による電解質保持効果がほぼ0であるため、放電容量が0．05mAhと低下した。

負極集電体(D－7)は、負極集電体(D－1)～(D－4)と比べて、負極集電体の占有体積に対する電解質保持部の容積比率が27%と低く、突起高さが十分ではない(

（突起高さ／負極成膜厚み）＝1．8）ため、電解質保持効果が十分に得られなかった。したがって、蓄電デバイス（D－7）では、蓄電デバイス（D－6）に比べて放電容量は若干改善されたが、蓄電デバイス（D－1）～（D－4）と比べて低い放電容量が得られた。

以上のことから、蓄電デバイスの充放電特性が向上するため、電解質保持部の容積比率は30％以上であるのが好ましいことがわかった。

[0156] 《実施例11》

正極活物質に上記π共役ポリマーを用いた実施例3と同じ正極積層体を用いる以外、実施例10の蓄電デバイス（D－1）と同様にして、蓄電デバイス（D－8）を作製した。

また、正極活物質に上記ラジカルポリマーを用いた実施例4と同じ正極積層体を用いる以外、実施例10の蓄電デバイス（D－1）と同様にして、蓄電デバイス（D－9）を作製した。

[0157] 蓄電デバイス（D－8）および（D－9）について、充放電容量評価を行った。充放電容量の評価は、充放電電流値4mA、充電上限電圧4．2V、および放電下限電圧2．75Vとし、充電休止時間および放電休止時間をそれぞれ1分として行った。充電休止時間とは、充電終了後、次の放電を開始するまでの時間である。この充放電を3回繰り返し、3回目の放電容量を充放電容量とした。

得られた充放電容量は、蓄電デバイス（D－8）では0．14mAh、蓄電デバイス（D－9）では0．08mAhであり、設計容量通りの高容量を得ることができた。いずれの場合も、負極集電体の占有体積に対する電解質保持部の容積比率が55％と高く、負極集電体に電解質を保持できた。

産業上の利用可能性

[0158] 本発明の蓄電デバイスは、高出力、高容量および優れた充放電繰り返し特性を有するので、輸送機器、電気・電子機器などの電源、無停電電源などとして好適に使用できる。輸送機器には、たとえば、ハイブリッド自動車などが挙げられる。電気・電子機器には、たとえば、移動体通信機器、携帯機器などが挙げられる。

請求の範囲

[1] 正極集電体と、

前記正極集電体上に配された、少なくともアニオンを可逆的に吸脱着可能な正極活物質を含む正極と、

負極集電体と、

前記負極集電体上に配された、実質的に、リチウムイオンを可逆的に吸蔵および放出可能な負極活物質からなる負極と、を備え、

前記負極活物質は、珪素、珪素含有合金、珪素化合物、錫、錫含有合金および錫化合物からなる群より選ばれる少なくとも1つであり、

前記負極は厚み10μm以下の薄膜であることを特徴とする蓄電デバイス。

[2] 前記負極の単位面積あたりの容量は、0．2～2．0mAh/cm^2である請求項1記載の蓄電デバイス。

[3] 前記正極の厚みが、前記負極の厚みの5倍以上である請求項1記載の蓄電デバイス。

[4] 前記負極の比表面積が、5以上である請求項1記載の蓄電デバイス。

[5] 前記負極集電体の比表面積が、5以上である請求項1記載の蓄電デバイス。

[6] 前記負極集電体の表面粗さRaの値が、前記負極の厚みと同じかまたはそれよりも大きい値である請求項1記載の蓄電デバイス。

[7] 前記負極活物質に予めリチウムが吸蔵されている請求項1記載の蓄電デバイス。

[8] 前記負極活物質へのリチウムの吸蔵が機械的に行われる請求項1記載の蓄電デバイス。

[9] 前記蓄電デバイスの充放電時において、前記負極のSOCが20％以上95％以下である請求項1記載の蓄電デバイス。

[10] 前記負極活物質が、珪素である請求項1記載の蓄電デバイス。

[11] 前記負極活物質が、珪素窒化物または珪素酸窒化物である請求項1記載の蓄電デバイス。

[12] 前記珪素化合物が、式SiOx（0＜x＜2）で表される珪素酸化物である請求項1記載の蓄電デバイス。

[13] 前記正極活物質が活性炭である請求項1記載の蓄電デバイス。

[14] 前記正極活物質が酸化還元可能な有機化合物である請求項1記載の蓄電デバイス。

[15] 前記有機化合物は分子内にラジカルを有する請求項14記載の蓄電デバイス。

[16] 前記有機化合物は分子内にπ共役電子雲を有する請求項14記載の蓄電デバイス。

[17] 前記負極集電体は電解質保持部を有し、

前記電解質保持部の容積が前記負極集電体の占有体積の30%以上である請求項1記載の蓄電デバイス。

[18] 前記負極集電体は電解質保持部を有し、

前記電解質保持部の容積が前記負極集電体の占有体積の50%以上である請求項1記載の蓄電デバイス。

[19] 前記負極集電体が、厚み方向に貫通する複数の貫通孔を有する多孔質膜である請求項1記載の蓄電デバイス。

[20] 前記負極集電体が、厚み方向に貫通する貫通孔を有さずかつ表面に複数の突起を有し、

前記突起の前記負極集電体の厚み方向の断面形状が台形状または擬台形状である請求項1記載の蓄電デバイス。

[21] 前記突起の高さが、前記負極の厚みの2倍以上である請求項20記載の蓄電デバイス。

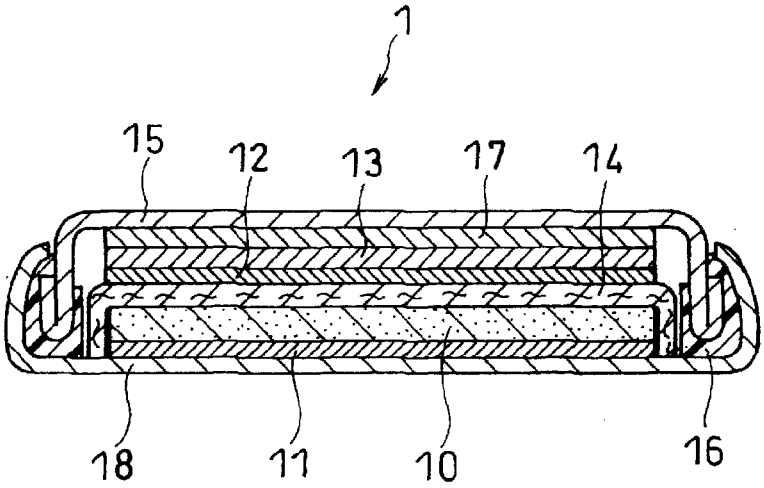
[22] 前記突起の先端部の少なくとも一部に、負極活物質を含む被覆層が形成されている請求項20記載の蓄電デバイス。

[23] 請求項1記載の蓄電デバイスを備えたノートPC。

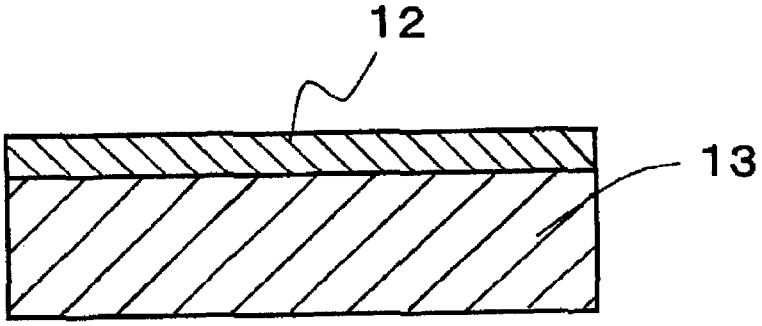
[24] 請求項1記載の蓄電デバイスを備えたハイブリッド自動車。

[25] 請求項1記載の蓄電デバイスを備えた携帯電話。

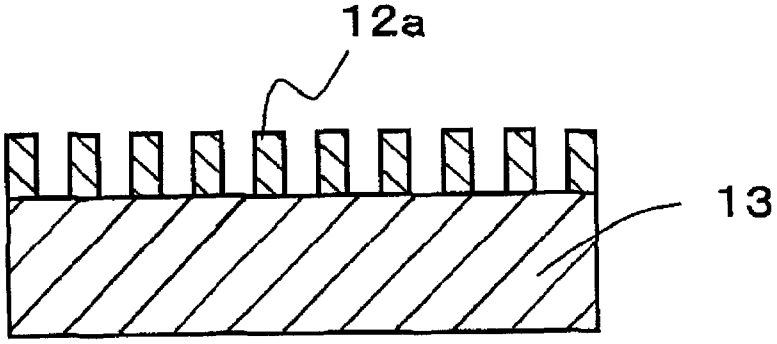
[図1]



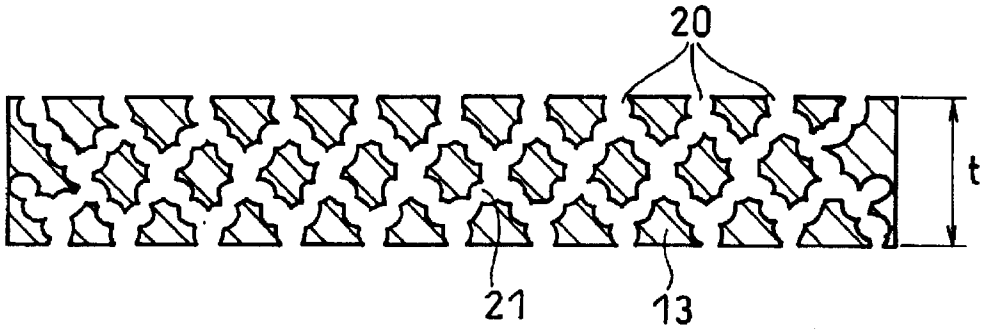
[図2]



[図3]



[図4]



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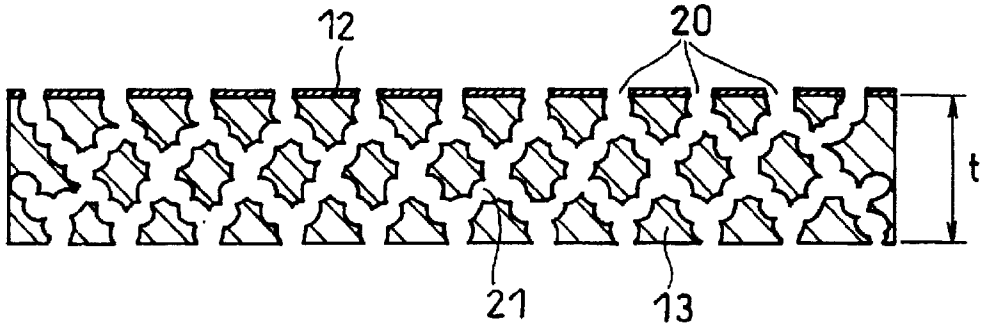
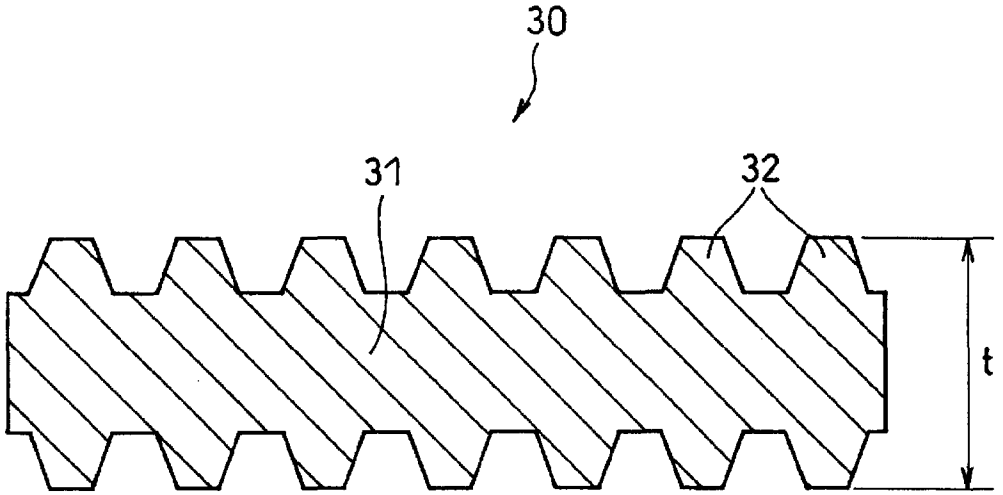
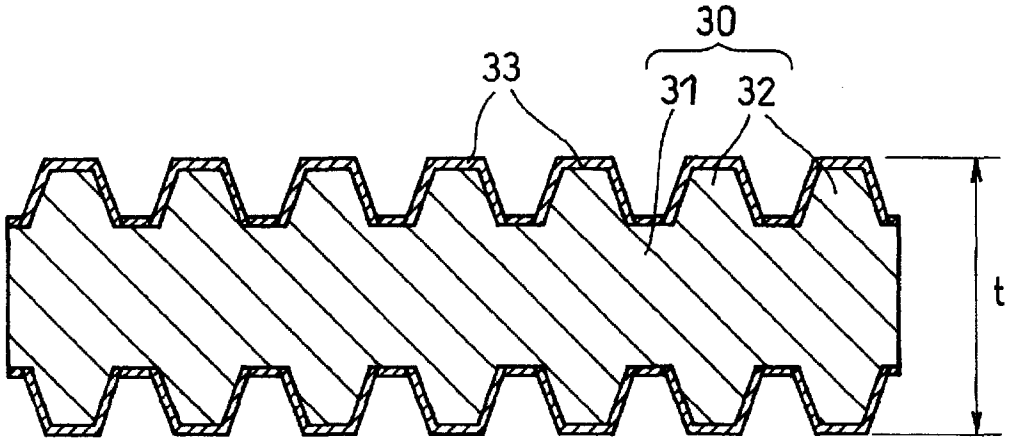


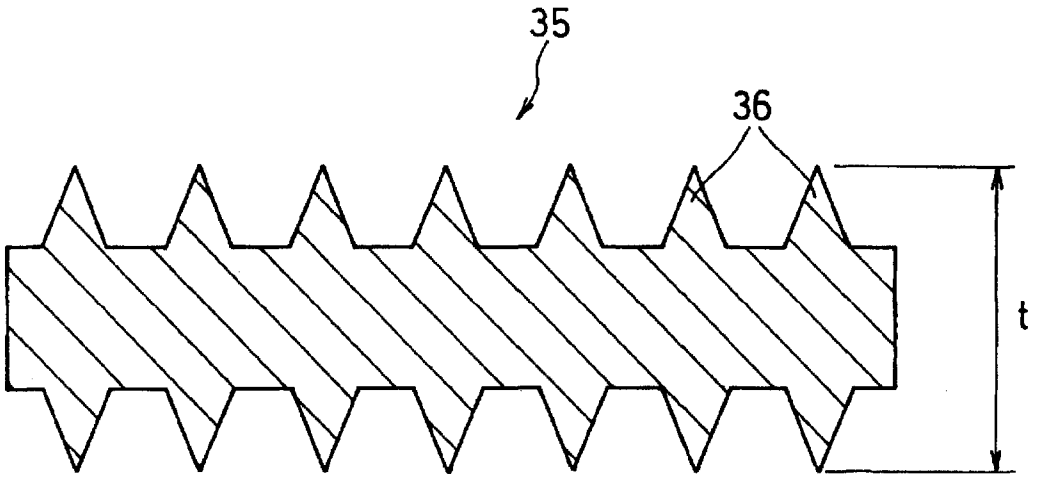
[図6]



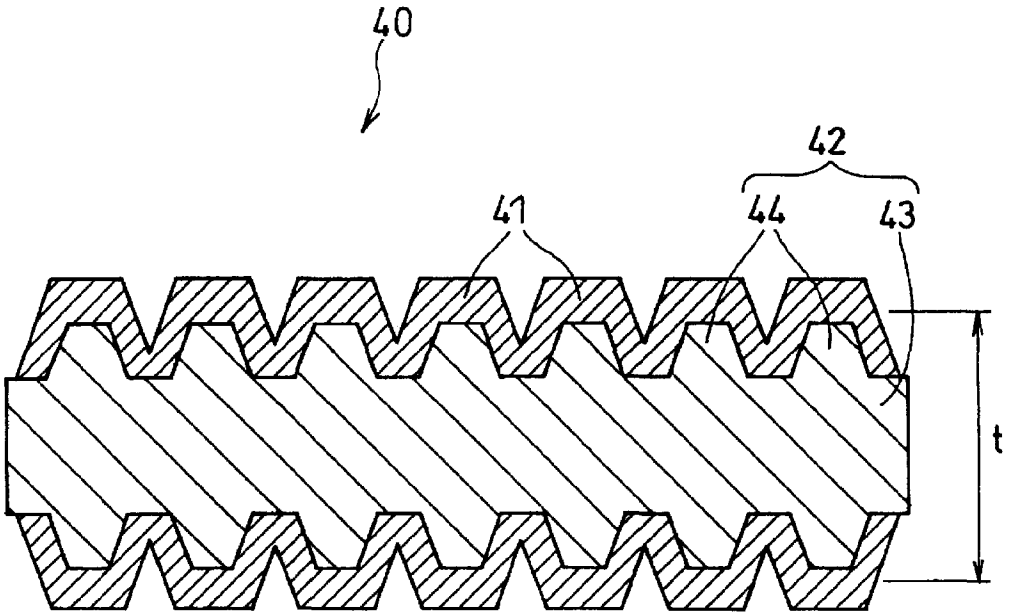
[図7]



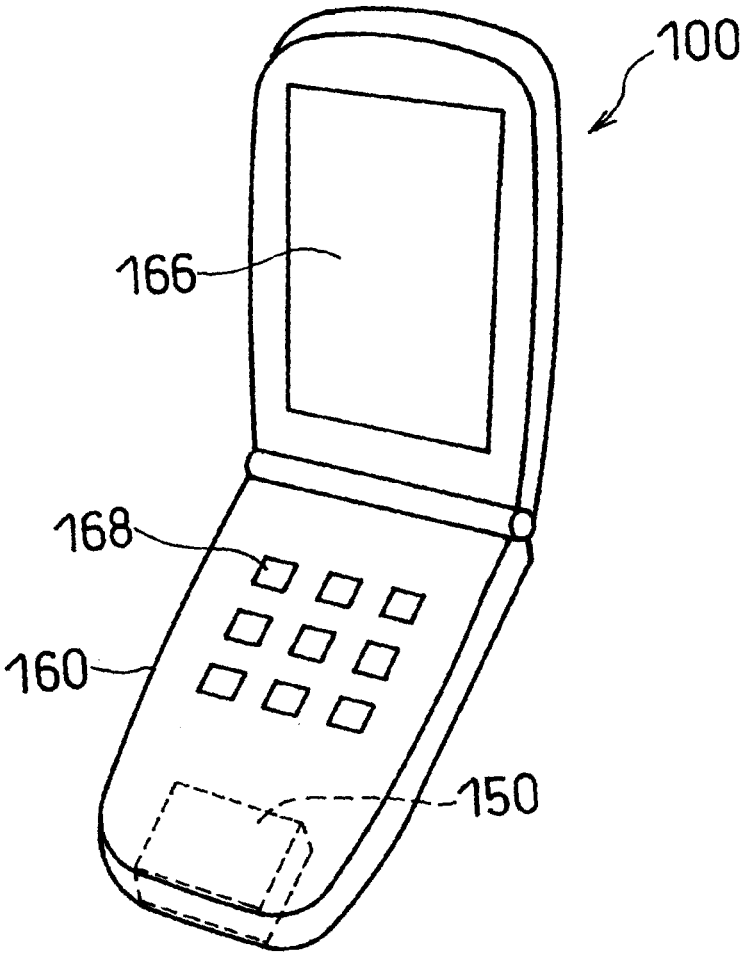
[図8]



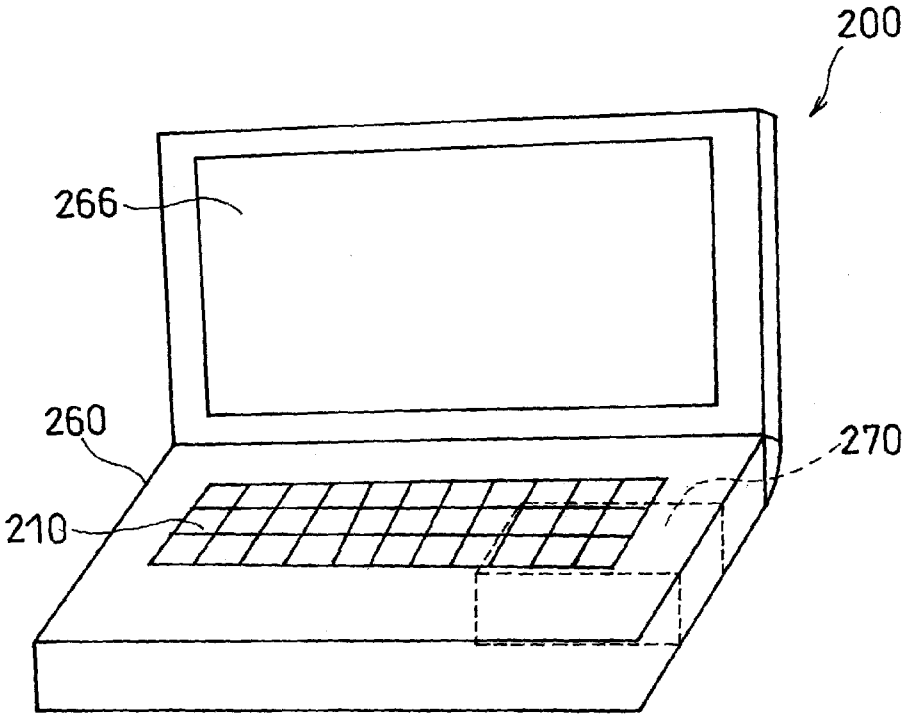
[図9]



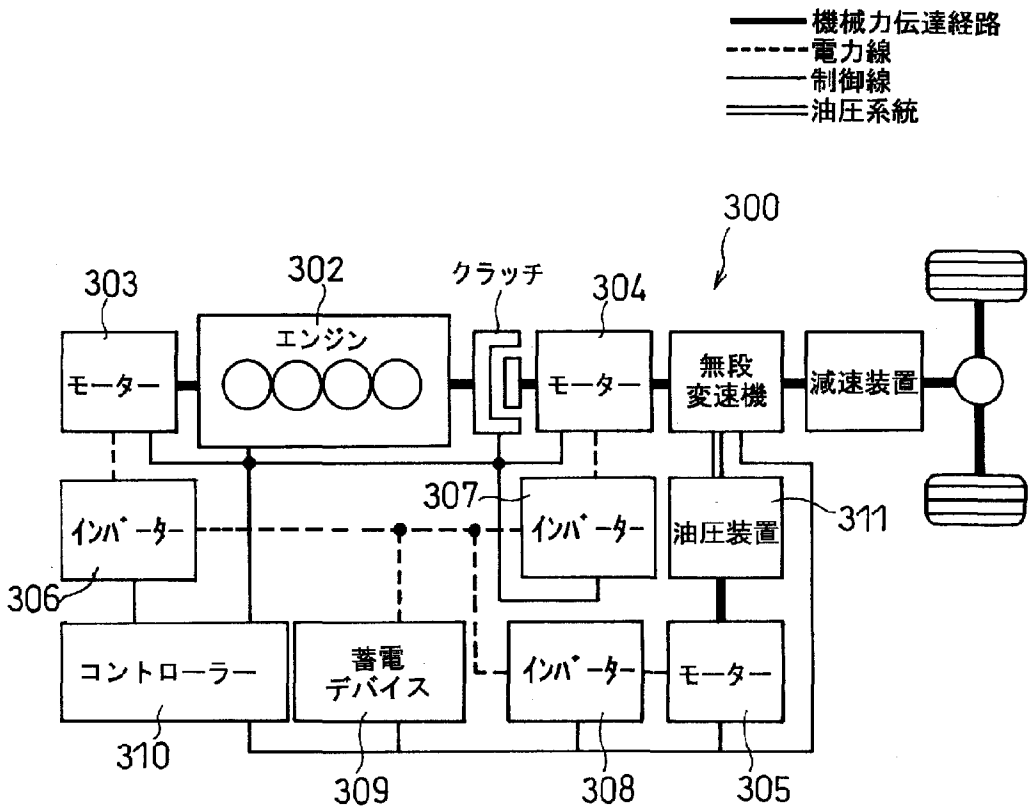
[図10]



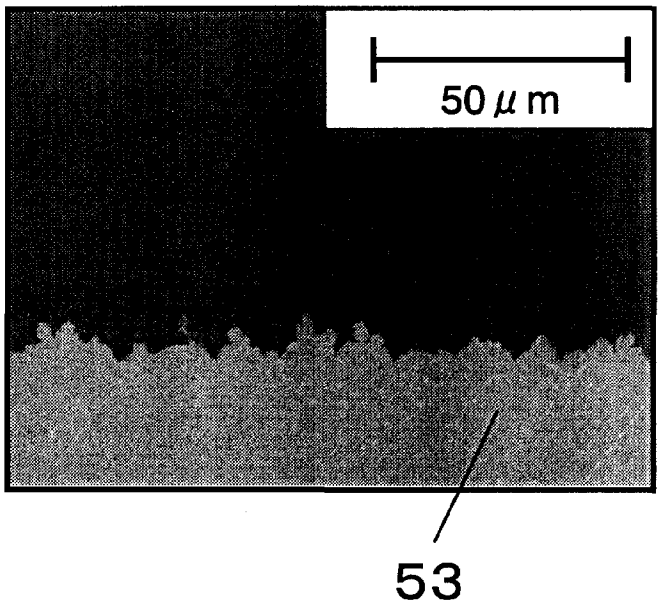
[図11]



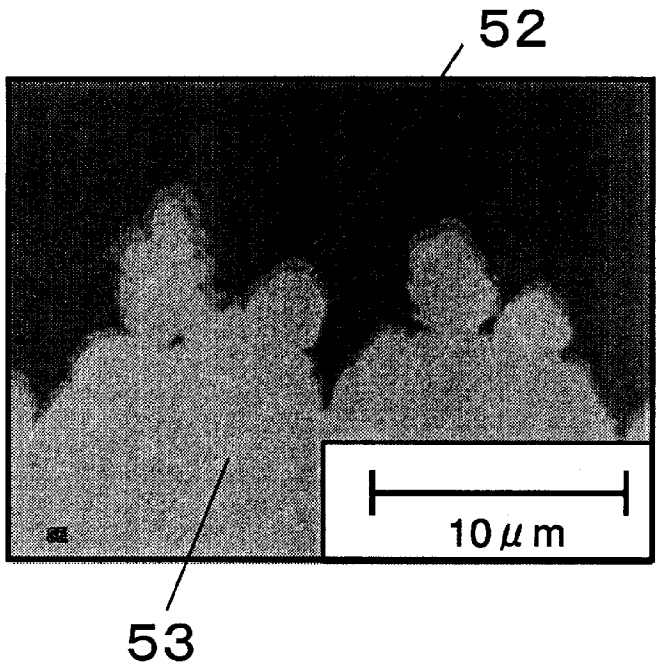
[図12]


機械力伝達経路
電力線
制御線
油圧系統
300
303
302
クラッチ
304
モーター
エンジン
モーター
無段
変速機
減速装置
307
インバーター
インバーター
油圧装置
311
306
コントローラー
蓄電
デバイス
インバーター
モーター
310
309
308
305

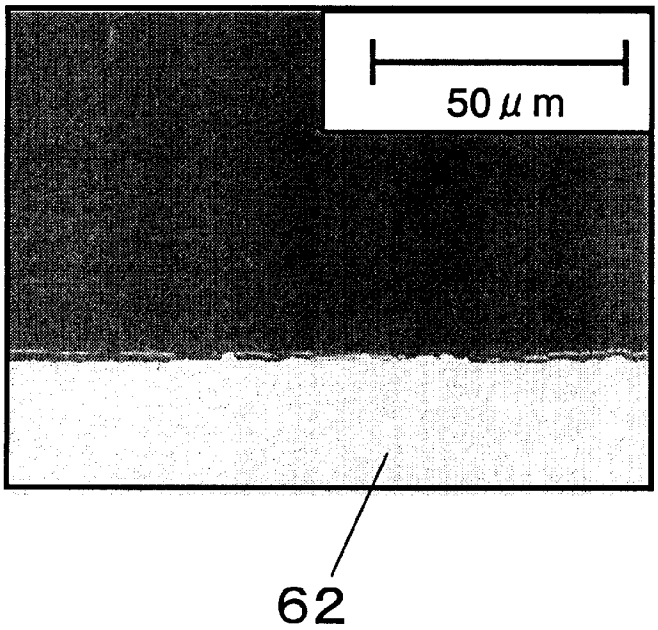
[図13]


50 μ m
53

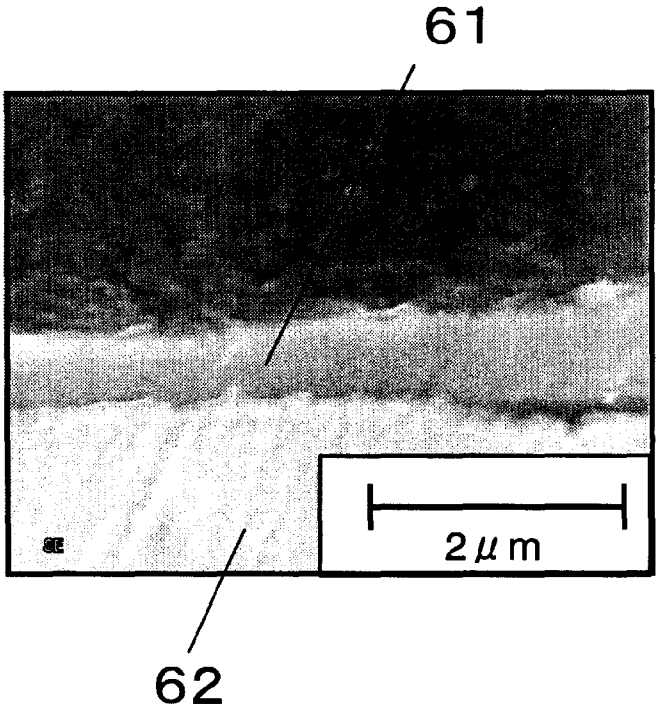
[図14]



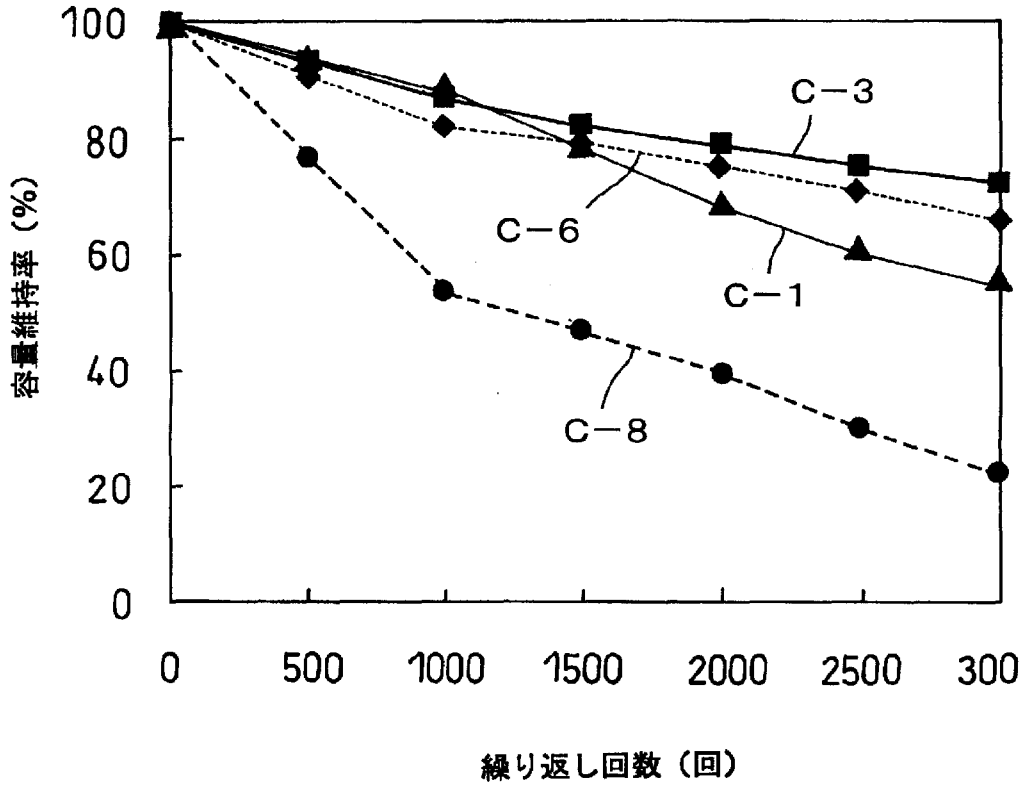
[図15]



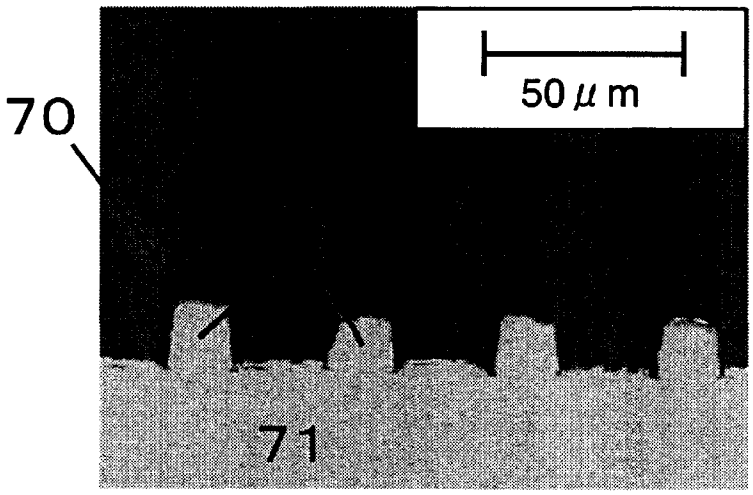
[図16]


61
2μm
62

[図17]


100
80
60
40
20
0
容量維持率（%）
C−3
C−6
C−1
C−8
0
500
1000
1500
2000
2500
300
繰り返し回数（回）

[図18]



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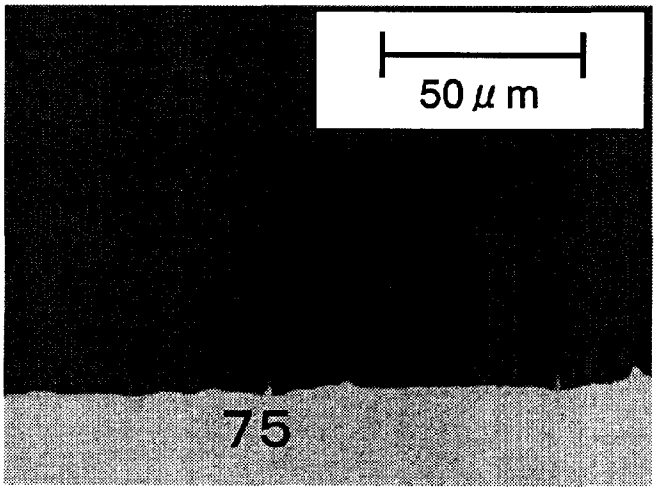

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/072027

A. CLASSIFICATION OF SUBJECT MATTER
H01M10/40(2006.01)i, *H01G9/058*(2006.01)i, *H01M4/02*(2006.01)i, *H01M4/38*(2006.01)i, *H01M4/48*(2006.01)i, *H01M4/58*(2006.01)i, *H01M4/60*(2006.01)i, *H01M4/70*(2006.01)i
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01M10/40, H01G9/058, H01M4/02, H01M4/38, H01M4/48, H01M4/58, H01M4/60, H01M4/70

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2005-259726 A (Yuasa Corp.), 22 September, 2005 (22.09.05), Par. Nos. [0011] to [0016] (Family: none)	1,3-5,10,13, 23-25 6,14,16, 19-20,22 2,7-9,11-12, 15,17-18,21
X Y A	JP 2005-190695 A (Sanyo Electric Co., Ltd.), 14 July, 2005 (14.07.05), Claims 1 to 4; Par. Nos. [0025] to [0026], [0036] (Family: none)	1-2,4-5,10, 13,23-25 6-8,19-20,22 3,9,11-12, 14-18,21
Y	WO 2002/058182 A1 (Sanyo Electric Co., Ltd.), 25 July, 2002 (25.07.02), Page 5, line 6 to page 6, line 11 & US 2005/0100790 A1	6

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 January, 2008 (24.01.08)	05 February, 2008 (05.02.08)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/072027

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2002-157995 A (Sanyo Electric Co., Ltd.), 31 May, 2002 (31.05.02), Claims 1, 3; Par. No. [0001] (Family: none)	14,16
Y	JP 2005-38612 A (NGK Spark Plug Co., Ltd.), 10 February, 2005 (10.02.05), Par. Nos. [0023], [0032] (Family: none)	19
Y	JP 2001-85016 A (Sony Corp.), 30 March, 2001 (30.03.01), Par. Nos. [0070] to [0071]; Figs. 5 to 6 (Family: none)	19-20,22
Y	JP 2002-25551 A (Sanyo Electric Co., Ltd.), 25 January, 2002 (25.01.02), Claim 5; Par. No. [0037] (Family: none)	7-8

国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２００７／０７２０２７

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl.　H01M10/40(2006.01)i, H01G9/058(2006.01)i, H01M4/02(2006.01)i, H01M4/38(2006.01)i, H01M4/48(2006.01)i, H01M4/58(2006.01)i, H01M4/60(2006.01)i, H01M4/70(2006.01)i

Ｂ．　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl.　H01M10/40, H01G9/058, H01M4/02, H01M4/38, H01M4/48, H01M4/58, H01M4/60, H01M4/70

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	１９２２－１９９６年
日本国公開実用新案公報	１９７１－２００８年
日本国実用新案登録公報	１９９６－２００８年
日本国登録実用新案公報	１９９４－２００８年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

Ｃ．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
X	JP 2005-259726 A(株式会社ユアサコーポレーション) 2005.09.22, 【００１１】－【００１６】	1, 3-5, 10, 13, 23-25
Y	(ファミリーなし)	6, 14, 16, 19-20, 22
A		2, 7-9, 11-12, 15, 17-18, 21

☑　Ｃ欄の続きにも文献が列挙されている。　　☐　パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー
「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの
「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの
「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「Ｏ」口頭による開示、使用、展示等に言及する文献
「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「＆」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
２４．０１．２００８	０５．０２．２００８

国際調査機関の名称及びあて先	特許庁審査官（権限のある職員）	４Ｘ	９３５１
日本国特許庁（ＩＳＡ／ＪＰ） 郵便番号１００－８９１５ 東京都千代田区霞が関三丁目４番３号	青木　千歌子 電話番号　０３－３５８１－１１０１　内線　３４７７		

様式ＰＣＴ／ＩＳＡ／２１０（第２ページ）（２００７年４月）

Ｃ（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
X Y A	JP 2005-190695 A(三洋電機株式会社) 2005.07.14, 【請求項１】－【請求項４】,【００２５】－【００２６】,【００３６】 (ファミリーなし)	1-2, 4-5, 10, 13, 23-25 6-8, 19-20, 22 3, 9, 11-12, 14-18, 21
Y	WO 2002/058182 A1(三洋電機株式会社) 2002.07.25, 第５頁，第６行－第６頁，第１１行 &US 2005/0100790 A1	6
Y	JP 2002-157995 A(三洋電機株式会社) 2002.05.31, 【請求項１】,【請求項３】,【０００１】 (ファミリーなし)	14, 16
Y	JP 2005-38612 A(日本特殊陶業株式会社) 2005.02.10, 【００２３】,【００３２】 (ファミリーなし)	19
Y	JP 2001-85016 A(ソニー株式会社) 2001.03.30, 【００７０】－【００７１】,【図５】－【図６】 (ファミリーなし)	19-20, 22
Y	JP 2002-25551 A(三洋電機株式会社) 2002.01.25, 【請求項５】,【００３７】 (ファミリーなし)	7-8

Notice

DESCRIPTION JPH1055496A

[0001]

13 INDUSTRIAL APPLICABILITY The present invention relates to an application system of a portable information and communication terminal, and in particular, a portable information and communication terminal owned by a vehicle user such as a vehicle owner or a driver (hereinafter, simply referred to as a driver). It relates to a remote management system for a parked vehicle by two-way communication with an information processing device mounted on the vehicle.

[0002]

22 [Conventional Technology] Currently, as an example of remote control of an automobile, there is a device that opens and closes a door lock and starts an engine by using infrared rays and radio waves, and is already installed in many automobiles.

[0003]

28 In addition, as a method of using an information communication terminal related to an automobile, route setting and route guidance are performed in combination with a position measuring device such as GPS (Global Positioning System) and a road information service such as ATIS (Advanced Traffic Information Service). In addition, a system for acquiring the latest road information such as road congestion has been put into practical use.

[0004]

36 PROBLEM TO BE SOLVED: To solve a problem As described above, conventionally, there is a service using various communication terminals and information processing devices as a means

for providing a service to a moving automobile, but a driver such as when parking. No one is known to provide services while away from the car.

[0005]

43 For parked cars, for example, there is a possibility of being tampered with, or the items in the car or the car itself may be stolen, but there is a need for measures to prevent these from happening, or to promptly notify the driver of the occurrence. be.

[0006]

49 It is also possible that some accident may occur in the car while the driver is away from the car, leaving children and pet animals in the car.

51 In particular, accidents due to dehydration and oxygen deficiency are likely to occur in a closed car, but children and animals often cannot take appropriate measures.

53 In such a case, if there is a means to check the inside of the car while the driver is away from the car, or to contact the driver in case of a dangerous situation, or to automatically avoid the danger. Accidents can be prevented.

[0007]

59 Therefore, an object of the present invention is to enable a driver to quickly know an abnormality that has occurred inside or outside the vehicle in a vehicle in which the driver is absent while parked, and automatically or by remote control from the driver. , To provide means to implement countermeasures and prevent the occurrence of serious incidents and accidents.

[0008]

67 Means for Solving the Problems In order to solve the above problems, the present invention presents the present invention to a vehicle from various sensors for detecting a state inside and outside the vehicle when the driver is away from the vehicle, and from the sensors. An information processing device for checking the data of the vehicle to determine whether an abnormality has occurred and a communication means for notifying the driver who is away from the vehicle of the abnormality and receiving an instruction are provided. To prepare a mobile communication terminal capable of communicating with the above-mentioned communication means mounted on the automobile, displaying data from the automobile, and inputting operation instructions to the automobile, and further, the above-mentioned automobile. The basic feature is that an operation means for executing necessary measures and operations in response to an instruction from the information processing device in the automobile or a remote operation instruction from the driver is provided.

[0009]

82 The features of the present invention are listed below.

[0010]

86 One feature of the present invention consists of an automobile, a portable communication terminal that can be carried by the driver of the automobile, and a communication medium between the automobile and the mobile terminal. In the automobile, the driver of the automobile is separated from the automobile. A plurality of detection means for detecting the surrounding condition of the automobile when the vehicle is located, a means for collecting data from the detection means, a means for recording the collected data, and a means for analyzing the collected data. For the means to judge whether an abnormality has occurred in the car or around the car body, the means to register the notification destination to the driver, and the driver who is away from the car when the judgment means detects the abnormality. A first two-way communicable communication means comprising means for notifying the occurrence of an abnormality and means for receiving an inquiry of the current state from the driver and transmitting the current state of the vehicle recorded in the recording means to the driver. The portable communication terminal that can be carried by the driver has a second communication means capable of bidirectional communication with the first communication means of the automobile, and has the same as the first communication means of the automobile. The second communication means of the portable communication terminal that the driver can carry is that bidirectional communication is possible via the communication medium.

104 As a result, bidirectional data communication can be performed between the driver and the vehicle in which the driver is away, and the inside and surrounding conditions of the vehicle can be monitored from a position away from the vehicle.

[0011]

110 Another feature of the present invention comprises a vehicle, a portable communication terminal that can be carried by the driver of the vehicle, and a communication medium between the vehicle and the mobile terminal. In the vehicle, the driver of the vehicle is separated from the vehicle. A plurality of detection means for detecting the surrounding condition of the automobile when the vehicle is located, a means for collecting data from the detection means, a means for recording the collected data, and a means for analyzing the collected data. A means for determining whether or not an abnormality has occurred in the vehicle or around the vehicle body, a means for registering a notification destination to the driver, a means for operating various devices mounted on the vehicle, and the above-mentioned determination means. A means for determining a method for dealing with an abnormality detected by the above-mentioned devices using the above-mentioned devices, a means for notifying a driver who is away from the automobile when the determination

means detects an abnormality, and a means for notifying the occurrence of the abnormality. It is equipped with a first two-way communication capable communication means consisting of a means for receiving an inquiry of the current state from the driver and transmitting the current state of the automobile recorded in the above-mentioned recording means to the driver. The portable communication terminal has a second communication means capable of bidirectional communication with the first communication means of the automobile, and the first communication means of the automobile and a portable portable communication means portable by the driver. The second communication means of the communication terminal is that bidirectional communication is possible via the communication medium.

131 As a result, bidirectional data communication is performed between the driver and the vehicle in which the driver is distant, the inside and surrounding conditions of the vehicle are monitored from a position away from the vehicle, and the vehicle is installed in the vehicle in which the driver is distant. It is possible to operate various devices.

[0012]

138 According to a further feature of the present invention, in the above-mentioned feature, the plurality of data collecting means have at least one means of inputting the sound in the vehicle and the means for inputting the image in the vehicle, and the voice, The image data is transmitted by the first communication means, the voice and image data are received by the second communication means possessed by the driver, and the voice and image data reproduction means provided in the mobile communication terminal is used in the vehicle. It is to play audio and images.

145 As a result, the driver can know the situation inside the distant car by voice and image.

[0013]

149 According to a further feature of the present invention, in the above-mentioned feature, at least one of the voice reproducing means and the image reproducing means is provided in the vehicle of the automobile, and at least one of the voice input means and the image input means is provided in the portable communication terminal of the driver. By connecting one of the means, the voice and image data transmitted by the driver by the second communication means are received by the first communication means and reproduced in the vehicle of the automobile.

156 As a result, the driver can send appropriate instructions by voice or image to the inside of a distant car.

[0014]

161 According to a further feature of the present invention, in the above-mentioned feature, the portable communication terminal carried by the driver has a means for inputting operation instructions for various devices mounted on the automobile, and the automobile is instructed

to operate by the driver. It has a means for controlling various devices mounted on the automobile by analyzing the above, and transmits an operation instruction input by the driver by the first communication means and the second communication means to the automobile.

168 This allows the driver to remotely control various devices mounted on a remote vehicle.

[0015]

172 According to a further feature of the present invention, in the above feature, the communication medium between the first communication means provided in the automobile and the second communication means provided in the mobile communication terminal carried by the driver is of a type. It consists of multiple bidirectional communication media with different characteristics.

177 As a result, various types of bidirectional data communication can be performed between the driver and the vehicle to which the driver is away, and various controls can be performed.

[0016]

182 According to a further feature of the present invention, in the above feature, the vehicle and the driver carry a communication means for performing operations such as starting / stopping the system and inputting a set value by using the mobile communication terminal of the driver. It is to have it with a communication terminal.

186 As a result, the driver can utilize this system only when remote monitoring and operation are really required.

[0017]

191 According to a further feature of the present invention, in the above feature, the occurrence occurs when the automobile has a means for registering at least one other notification destination other than the driver, and the above-mentioned determination means detects the occurrence of an abnormality. It has a function to determine whether it is necessary to notify other notification destinations other than the driver based on the content of the abnormality, and notifies the other notification destinations of the occurrence of the abnormality using the first communication means. That is.

198 This allows the driver to deal with unforeseen circumstances in a car away from the driver with the help of other notification destinations.

[0018]

203 BEST MODE FOR CARRYING OUT THE INVENTION FIG. 1 shows a system configuration example of a typical embodiment of the present invention.

205 The remote control system 1 of an automobile according to the present embodiment is

composed of an information processing device 2 mounted on the automobile 12, a sensor group 8 connected to the information processing device 2 for detecting a state inside and outside the automobile 12, and an information processing device 2. A mobile phone 6 as a means of communication between a controllable operation device group 9 consisting of various operation devices mounted on the automobile 12, a driver 13 away from the automobile 12, and an infrared interface as another communication means. It is composed of 7, a mobile communication terminal 10 owned by the driver 13, and a mobile phone 11.

213 By using a mobile phone, the driver 13 can communicate between the mobile communication terminal 10 and the information processing device 2 mounted on the automobile 12 by using a general line network.

216 Further, the infrared interface of the mobile communication terminal 10 of the driver 13 enables communication with the remote control system 1 of the automobile 12 from inside the automobile 12 or within a range in which infrared communication can be used.

[0019]

222 Communication between the information processing device 2 and the mobile communication terminal 10 of the driver 13 is performed by a mobile phone or serial data communication by infrared rays.

225 As the mobile phone 6 of the automobile 12 and the mobile phone 11 of the driver, a digital cellular telephone advantageous for data communication is used in this example, but an analog cellular telephone, PHS, or the like may be used.

228 Further, in this example, the IrDA (Infrared Data Associations) standard used for general mobile communication terminals is used as the communication protocol of the infrared interface 7.

[0020]

234 The information processing apparatus 2 is actually composed of a sensor group 8, an interface with the device group 9, a microcomputer, and a memory, but FIG. 1 shows a configuration divided into functional blocks.

237 That is, the information processing apparatus 2 controls the sensor group 8 to collect and record data, and the data collection / recording unit 3 analyzes the data to determine whether or not an abnormality has occurred, and takes necessary measures when an abnormality occurs. It is composed of an analysis / processing determination unit 4 for instructing execution, and a control unit 5 for controlling various devices mounted on the automobile 12 according to instructions from the analysis / processing determination unit 4.

[0021]

246 The data collection / recording unit 3 includes an interface unit with the sensor group 8 and a storage device for storing the collected data.

[0022]

251 The analysis / processing judgment unit 4 is informed of the driver's personal data such as the notification destination, name, and address of the driver, the vehicle type of the vehicle 12, the vehicle's unique data such as the registration number, and the public organizations such as police and fire department. Includes an interface unit between a storage device for storing destination data and the like and a communication means.

256 As the interface unit with the communication means, there are two interface units, the in-vehicle mobile phone 6 and the infrared interface unit 7, both of which are controlled by the analysis / processing determination unit 4.

[0023]

262 As the storage device of the data collection / recording unit 3 and the analysis / processing determination unit 4, a semiconductor memory that is not easily affected by vibration or impact is used because it is mounted on an automobile.

265 However, a magnetic disk device or an optical disk device may be used if sufficient measures can be taken.

[0024]

270 Examples of the devices included in the sensor group 8 include an in-vehicle thermometer 81, a door lock open / close sensor 82, a battery voltmeter 83, a GPS receiver 84, a camera 85 and a microphone 86 for observing the inside of the vehicle, and vehicle body movement and weight. There is a suspension displacement sensor 87 and the like for detecting changes, and a thermometer 88, an engine tachometer 89 and the like, which are instruments of the automobile 12, are connected.

276 In this example, the camera 85 is a video camera capable of shooting a moving image, but may be a camera that shoots a still image such as a digital still camera.

278 In addition to the above, a sensor (not shown) for detecting the opening / closing of doors, trunks, bonnets, windows, etc., a microphone for capturing sound outside the vehicle body, and an acceleration sensor for the vehicle body can also be provided.

[0025]

284 Some or all of these sensor groups 8 may be shared with other systems operating during traveling.

286 For example, the GPS receiver 84 can be shared with the car navigation system, and the suspension displacement sensor 87 can be used as a sensor for the active suspension system.

[0026]

291 Examples of the devices constituting the device group 9 mounted on the automobile 12 controlled by the control unit 5 include an air conditioner 91, a door lock opening / closing device 92, a horn 93, a display device 94, a speaker 95, an engine starter 96, and the like. ..

294 In this example, the control unit 5 is one of the components of the information processing device 2 independent of the automobile 12, but the automobile 12 is configured to be the same as the means for controlling various device groups 9 in a normal state. It can also be.

[0027]

300 As described above, the communication between the information processing device 2 mounted on the automobile 12 and the mobile terminal 10 of the driver 13 is performed by serial data communication, but when a mobile phone is used, an abnormality is caused by voice to the driver. You may be notified.

304 In this case, in addition to the configuration shown in FIG. 1, the information processing device 2 is provided with a device for performing voice synthesis or a device for reproducing a message for notifying an abnormality recorded in advance on a magnetic tape or the like.

[0028]

310 FIG. 2 shows the state transition of the remote control system 1 of the automobile according to the embodiment of the present invention shown in FIG.

[0029]

315 While the vehicle is running, the system is in hibernation state 20.

316 In this state 20, for example, a completely different system such as a navigation system may be operated on the information processing apparatus 2.

318 Alternatively, as another embodiment, a system may be configured such that navigation and collection of road information are performed while traveling as one of the operation modes of the system.

[0030]

324 When the car stops and the driver starts the system, the system shifts to the system setting mode 21.

326 In this state, the driver can make various settings for the system.

[0031]

330 For example, it is possible to specify the contact information for the driver in the event of an abnormal situation, set the environment such as the room temperature in the automobile,

and the like.

333 In this example, it is assumed that the set value can be input from the driver's mobile communication terminal 10 by infrared communication.

335 When the system setting is completed and the driver gets out of the car and locks the door, or if the driver does not get off and instructs to start monitoring, the system shifts to the initialization mode 22. In this mode, data is collected from the sensor group 8. Record the current state as the initial state.

339 Even if the driver does not get out of the car, the system can monitor and control the car if the driver cannot control the car directly, such as when taking a nap.

341 When the initialization is completed, the mode shifts to the monitoring mode 23, and monitoring of the state inside and outside the vehicle is started.

[0032]

346 In the monitoring mode 23, when the mobile phone 6 receives the communication from the driver, the mode shifts to the remote monitoring mode 24.

348 In the remote monitoring mode 24, the driver can check the state of the car from a distance by transmitting the current state of the car to the driver. The driver can also remotely control the devices in the car. The remote monitoring mode 24 is canceled when the driver disconnects the communication, and the mode shifts to the monitoring mode 23.

[0033]

355 In this system, in addition to the communication means by the mobile phone 6, the communication means by the infrared interface 7 is provided.

357 Normally, the infrared interface 7 can be used by the driver to input a set value using the mobile communication terminal 10 in the system setting mode 21, but in the state of the monitoring mode 23, the infrared interface 7 can be used from inside the vehicle or from the vicinity of the vehicle. When there is an input to the infrared interface 7, the mode shifts to the external input mode 28. In this mode, data communication with the outside can be performed, and instead of opening the door using the key, the driver can unlock the door by inputting infrared rays from the mobile communication terminal 10 as in the conventional remote control. can. At this time, the system shifts to the pre-start check mode 29. The input command to the infrared interface 7 is provided with a driver identification code to prevent unauthorized input. However, in this example, in case of an emergency, the police officer, the firefighter, or the like can input the police / firefighting identification code input from the mobile terminal to shift to the external input mode 28. When the mode shifts to the external input mode 28 by input from other than the driver, the function may be limited or another function may be added.

[0034]

374 When an abnormality is detected inside or outside the vehicle in the monitoring mode 23 and the remote monitoring mode 24, the process shifts to the in-vehicle abnormality handling mode 25 or the out-of-vehicle abnormality processing mode 26.

377 In these modes, countermeasures against the detected abnormality are automatically executed, and the driver is notified of the occurrence of the abnormality. When it recovers from the abnormal situation, it returns to the mode before the abnormality occurred.

[0035]

383 Further, in the out-of-vehicle abnormality handling mode 26, if it is determined that the vehicle has been stolen, the mode shifts to the theft processing mode 27.

385 In this mode, not only can the driver be notified of the theft, but the police can also be notified. It also has a function to notify the driver and police of the current position at regular intervals. This mode is maintained until the driver or the police secure the vehicle and shift to the external input mode 28 by inputting from the mobile communication terminal by the infrared interface.

[0036]

393 When the driver returns to the car and instructs to cancel the monitoring mode, the system shifts to the pre-start check mode 29. In this mode, the state of the car recorded in the initialization mode 22 is compared with the current state of the car. After confirming that there is no abnormality, the system shifts to the system hibernation state 20.

[0037]

400 FIG. 3 shows a processing flow in the monitoring mode 23.

401 In this mode, data collection (step 30), data storage, and data analysis are performed, and if an abnormality is detected outside the vehicle as a result of determining whether or not an abnormality has occurred outside the vehicle (step 31), the mode shifts to the outside vehicle abnormality processing mode 26. Then, if an abnormality is detected inside the vehicle as a result of determining whether or not an abnormality has occurred in the vehicle (step 32), the mode shifts to the in-vehicle abnormality handling mode 25, and as a result of the determination in step 33, the infrared interface 7 is input. When the communication is detected, the mode shifts to the external input mode 28, and as a result of the determination in step 34, when the communication from the driver is detected by the mobile phone 6, the mode shifts to the remote monitoring mode 24. After confirming that it has returned to, the mode shifts to the pre-start check mode 29.

412 If none of the above applies, the process returns to the data collection step 30 again.

[0038]

416 FIG. 11 shows a configuration example of the data display screen 1100 of the mobile communication terminal 10 of the driver 13 in the remote monitoring mode 24.

418 On the left side of the screen, the state of the automobile based on the data from the sensor group 8 installed in the automobile 12, such as the temperature, humidity, and the state of the door lock in the car, is displayed. On the right side of the screen, there are operation screens of various device groups 9 mounted on the automobile. In this example, the mobile communication terminal 10 of the driver 13 can be input by touching the screen with a pen, and the set values of the temperature and humidity in the vehicle can be changed by touching the up / down buttons 1101, and the air conditioner 91 and the door lock can be changed. The operation of the opening / closing device 92 can be operated by the radio button 1102. When the capacity of the battery becomes insufficient, the engine can be automatically started to charge the battery, but the driver 13 can also touch the charging start button 1103 to charge the battery. When viewing the image of the camera 85 installed in the automobile 12, the image of the inside of the vehicle can be viewed by touching the in-vehicle camera button 1104.

[0039]

434 When shifting from the remote monitoring mode 24 to the in-vehicle error handling mode 25 or the out-of-vehicle abnormality processing mode 26, the in-vehicle abnormality processing mode button 1105 or the out-of-vehicle abnormality processing mode button 1106 displayed on the data display screen 1100 is inverted and the driver 13 Is notified of the start of abnormal processing.

439 Further, the driver 13 who has checked the data on the data display screen 1100 can touch these buttons to forcibly shift to each abnormality processing mode.

[0040]

444 FIG. 12 shows a configuration example of a screen 1200 for viewing an image of a camera 85 of an automobile 12 using a mobile communication terminal 10 of a driver 13.

446 The camera 85 can be remotely controlled from a mobile communication terminal, and can be operated by touching the move button 1201 or the zoom button 1202 displayed on the screen. To return to the data display screen 1100, touch the data display button 1203.

[0041]

452 FIG. 4a shows the processing flow of the in-vehicle abnormality handling mode 25, and FIG. 4b shows the processing flow of the out-of-vehicle abnormality processing mode 26.

454 In either mode, it is necessary to first determine what happened by referring not only to the data of the sensor that detected the abnormal data but also to the data of other sensors (steps 401 and 411), and then process in the other mode. If it is determined, or if it is determined that the error has been recovered, the mode shifts to another mode (steps 402,

403, 421, 413, 414). In particular, in the outside-vehicle abnormality handling mode 26, when the engine start and the movement of the vehicle are detected and it is determined that the vehicle has been stolen, the mode shifts to the theft mode 27. If it is not necessary to shift to another mode, the measures to be taken are determined (steps 404, 415), the driver is notified if necessary (steps 405, 416), and the measures are taken (steps 406, 417). After executing the countermeasures, data is collected from the sensor group 8 (steps 407 and 418), and if the transition is from the remote monitoring mode 24, the current data is notified to the driver (steps 408 and 409), and an abnormal situation occurs. Return to step 401 or step 411 to confirm whether the recovery has occurred.

[0042]

470 FIG. 5a shows an example of the types of abnormal situations that can be handled in the in-vehicle abnormality handling mode 25 and the measures to be taken.

[0043]

475 For example, in response to changes in temperature and humidity inside the vehicle, the system setting mode 21 instructs the execution of temperature control, and by setting the temperature and humidity, the temperature and humidity are monitored in the monitoring mode 23. , The temperature and humidity inside the vehicle are adjusted in the vehicle interior abnormality processing mode 25.

480 If the heater is turned on or the battery capacity is reduced after cooling for a long time, after confirming that the gear is in neutral, start the engine with the engine starter 96 to heat and charge the battery.

[0044]

486 Further, when the vehicle is provided with a means for detecting a fire such as a smoke sensor, the analysis / processing determination unit 4 can easily detect the occurrence of a fire together with the data of the thermometer 81.

489 When the occurrence of a fire is detected, it can be set not only to notify the driver 13 but also to automatically notify the fire department.

[0045]

494 FIG. 5b shows an example of the types of abnormal situations that can be handled in the out-of-vehicle abnormality handling mode 26 and the measures to be taken.

496 For example, when the vehicle body is damaged due to a collision of another vehicle with the parked vehicle 12, the impact at the time of collision, the shaking of the vehicle body, etc. are detected by the accelerometer and the suspension displacement sensor, and the sound outside the vehicle body is emitted. Since the impact sound is detected in the catching

microphone, the analysis / processing determination unit 4 can determine that the vehicle body may have been damaged, and can notify the driver 13 to that effect.

[0046]

505 In this example, the system configuration is such that the abnormal situations that occur inside and outside the vehicle are dealt with separately in the in-vehicle abnormality handling mode 25 and the out-of-vehicle abnormality processing mode 26, respectively. The system may be configured to have an operation mode for collectively handling abnormal situations that occur inside and outside the system.

[0047]

513 FIG. 6 shows the operation of the system when the driver leaves the car with a child 61 or a pet animal 62 in the car as an example of using the remote control system of the car of the present invention.

516 While the driver is away from the vehicle, the system is operating in the monitoring mode 23, and when an abnormality in the vehicle as shown in FIG. 5a is detected, the system shifts to the in-vehicle abnormality handling mode 25 to handle the abnormality. To do.

519 For example, when the temperature inside the vehicle rises, it is necessary to operate the air conditioner 91 to cool the inside of the vehicle, but in many cases, the operation cannot be performed by the child 61 or the pet animal 62.

522 In such a case, the information processing device 2 can automatically control the air conditioner 91 to perform cooling.

[0048]

527 When the driver wants to check the inside of the vehicle, he / she can monitor the inside of the vehicle by communicating with the mobile communication terminal 10 and the mobile phone 11 of the driver and switching the system to the remote monitoring mode 24.

530 Further, in the remote monitoring mode 24, the state of the inside of the vehicle can be confirmed by images and sounds by the camera 85 and the microphone 86 in the vehicle. Further, by connecting the camera 63 and the microphone to the mobile communication terminal 10 of the driver, transmitting the camera 63 and the microphone to the car, and reproducing the sound from the display device 94 and the speaker 95, bidirectional communication by image and voice can be performed in the car. It is possible to give a sense of security to the remaining child 61.

[0049]

540 FIG. 7 shows another example of the use of the remote control system for a vehicle of the present invention, in which the driver is tampered with by the vehicle or the luggage 72 in

the vehicle is about to be stolen while the driver is away from the vehicle. Shows the operation.

544 Normally, the system operates in the monitoring mode 23 as in the case of FIG. When a suspicious person 71 tries to mischief the car and kicks or scratches the car body, an abnormal sound is input to the microphone 73 that collects the sound outside the car body, and the information processing device 2 has, for example, the frequency of the sound. By analyzing the components, it is detected that the vehicle body has been tampered with, and the system shifts to the outside abnormality processing mode 26. Similarly, when someone shakes the vehicle body or gets on the vehicle body, the suspension displacement sensor 87 detects an abnormality. In addition, when the door or trunk is pried open, each open / close sensor detects it. When the system shifts to the out-of-vehicle abnormality processing mode 26, the horn 93 is sounded to warn the suspicious person 71 as the first countermeasure against the above-mentioned abnormal situation, and the mobile phone 6 is used to notify the driver of the occurrence of the abnormal situation. The driver who receives the notification can see the state inside and outside the car from the image of the camera 85 in the car, and can confirm whether the luggage 72 in the car has been stolen.

[0050]

561 FIG. 8 shows an example of the processing flow of the theft mode 27 in the remote control system of the automobile of the present invention.

[0051]

566 When an abnormality such as the door being pried open is detected in the monitoring mode 23, the vehicle shifts to the outside abnormality processing mode 26 and the horn 93 is sounded. When the start and the movement of the car are detected, the mode shifts to the theft mode 27.

570 In the theft mode 27, first of all, the driver is notified that the driver has been stolen.

571 The notification is made using the mobile phone 6 (step 801).

[0052]

575 Next, if it is set to report to the police from the automobile side, the mobile phone 6 is used to report to the police (step 802).

577 After that, reporting the current position to the driver and police at regular time intervals is repeated until the driver or police officer cancels it by external input. When the input is made to the infrared interface 7 from the mobile terminal of the police officer (step 804), the driver can be notified that the car has been secured by the police (step 805). By performing such processing, the theft of the car can be known quickly, and the current position can be automatically transmitted, so that the stolen car can be detected at an early stage.

[0053]

586 FIG. 9 shows, as one of the application examples of the remote control system for an automobile of the present invention, an embodiment in which the system and the driver / police cooperate with each other when the automobile is stolen.

589 If the parked vehicle 900 is stolen, the vehicle's remote control system reports the theft to the driver and police, respectively, as shown in the processing flow of FIG. 8 (steps 901 and 902).

[0054]

595 Normally, the police are reported by voice as in the general case, but in this example, another method is to provide the police with a dedicated data communication line for receiving the theft report from the car, so that the stolen car can report to the police. After receiving the report, we will continue to receive information necessary for arranging investigations such as vehicle type, number, body color, contact information for the driver, etc., and automatically issue administrative procedures such as issuing damage reports and police cars on patrol. -It is also possible to make arrangements with police officers (step 903).

[0055]

605 If a stolen car is found (step 904), the police officer's mobile terminal 907 can switch the car's remote control system to external input mode 28 and inquire whether the car has been arranged. (Step 905).

608 At this point, the remote control system of the car can notify the driver with the mobile phone 6 that the vehicle has been found by the police, and after the police confirm that the vehicle has been arranged, the driver can be notified (). Step 906).

611 Such a system can efficiently search for stolen vehicles and carry out related procedures.

[0056]

615 Another example of how to use the external input mode 28 by a police officer's mobile terminal is to use it when cracking down on parking violations.

617 When a vehicle equipped with the remote control system of the vehicle of the present invention is parked in a no-parking area, the police officer performing the crackdown uses a mobile terminal to extract the driver's contact information from the system that has entered the external input mode 28. Can directly advise the driver to move the car. As a result, the number of vehicles that park illegally for a long time is reduced, which not only contributes to the elimination of road congestion, but also makes it clear when the parked vehicle can move because it can directly contact the driver, and work such as tow truck movement. Can also be reduced.

[0057]

628 FIG. 10 shows a case where the remote control system for an automobile of the present invention is linked with a monitoring system such as a parking lot as another embodiment.

630 Here, as an example of a vehicle that requires particularly strict monitoring, an automobile 1000 used for moving an important person (VIP) is taken as an example. Such a vehicle is constantly under strict surveillance while driving due to the movement of the VIP, but it is necessary to monitor the vehicle even if it is parked and the VIP is not on board.

[0058]

637 The remote control system for an automobile according to the present embodiment has the same configuration as that shown in FIG. 1, but in addition, the mobile phone 6 and the infrared interface 7 are used as communication means of the information processing device 2 of the automobile 1000. In addition, it has a wired communication means, and has a connector 1001 on the vehicle body for performing wired communication with the outside.

642 Wired communication is serial communication like other communication means, but parallel communication may be used because it is wired.

[0059]

647 Further, in this example, the connector 1001 is used not only for wired serial data communication but also for supplying power for operating a remote control system of an automobile.

650 After the automobile 1000 is parked in the parking lot, the signal / power line 1003 of the parking lot is connected to the connector 1001. The signal / power line 1003 of the parking lot is connected to the management information processing device 1011 in the management building 1010 of the parking lot, and the remote control system of the automobile shifts to the remote monitoring mode by the input from here, and the signal / power line 1003 of the parking lot shifts to the remote monitoring mode in the parking lot. It can be monitored by the management information processing device 1011 together with other automobiles. Since the power can be supplied from the outside, the limitation due to the battery capacity of the automobile 1000 is removed, so that long-term monitoring can be performed and the device with relatively high power consumption installed in the vehicle can be continuously used. It will be possible. For example, the camera 85 and the obstacle sensor 1002 using ultrasonic waves and radio waves provided around the vehicle body to detect obstacles while driving or entering the garage are used to monitor the surroundings of the automobile 1000 for a long time. be able to. With the same configuration, it is possible to collectively monitor waiting vehicles not only in the parking lot but also in the garages of transportation companies and taxi companies.

[0060]

669 [Effect of the Invention] As described above, the remote control system of the automobile of the present invention makes it possible to grasp the situation inside and outside the automobile even while the driver is away from the automobile, and whether an accident or the like has occurred. Can be confirmed.

[0061]

676 In addition, by automatically controlling the equipment in the car or remotely controlling it by the driver, the inside of the car can be kept comfortable for children, animals, etc. left in the car, and the inside of the car can be transmitted to the driver as an image. It is possible to prevent the occurrence of accidents due to oxygen deficiency and dehydration.

[0062]

683 In addition, if the car is tampered with or collided, it can be detected by various sensors installed on the car body and honking the horn to drive away the mischievous person and prevent the car body from being damaged. It is possible to notify the driver as soon as the vehicle body is damaged. ..

[0063]

690 In the unlikely event that a car is stolen, the driver and police can be automatically notified and the current location can be notified regularly, so the car can be easily found.

[0064]

695 A brief description of the drawing

[0065]

699 FIG. 1 is a system configuration diagram showing an embodiment of a remote control system for an automobile according to the present invention.

[0066]

704 FIG. 2 is a state transition diagram of the system shown in FIG.

[0067]

708 FIG. 3 is a flow chart showing processing in the monitoring mode of the system shown in FIG.

[0068]

712 FIG. 4 is a diagram showing a processing flow in an in-vehicle abnormality processing mode and an out-of-vehicle abnormality processing mode of the remote control system of the automobile of the present invention of the system shown in FIG. 1.

[0069]

718 FIG. 5 is a chart showing the types of abnormalities in the in-vehicle abnormality handling mode and the out-of-vehicle abnormality processing mode of the system shown in FIG. 1 and an example of countermeasures to be taken.

[0070]

724 FIG. 6 is an explanatory diagram showing a case of confirming the state of children and animals in the vehicle of the system shown in FIG. 1.

[0071]

729 FIG. 7 is an explanatory diagram showing a case where the system shown in FIG. 1 monitors mischief and theft of luggage with respect to an automobile.

[0072]

734 FIG. 8 is a flow chart showing processing in the theft mode of the system shown in FIG.

[0073]

738 FIG. 9 is a system configuration diagram showing an embodiment in which a remote control system for an automobile of the present invention and a police system are linked.

[0074]

743 FIG. 10 is a system configuration diagram showing an embodiment in which a remote control system for an automobile of the present invention and a parking lot monitoring system are linked.

[0075]

749 FIG. 11 is a configuration diagram of a data display screen of a mobile communication terminal of a driver.

[0076]

754 FIG. 12 is a configuration diagram of an in-vehicle video display screen of the driver's mobile communication terminal.

[0077]

759 Description of the sign

[0078]

763 1 ... Automotive remote control system, 2 ... Automotive information processing device, 6 ... Mobile phone, 7 ... Infrared I / F, 10 ... Driver's mobile communication terminal, 11 ... Driver's mobile phone, 12 ... Automotive, 13 ... Driver , 81 ... thermometer, 84 ... GPS receiver, 85 ... camera, 91 ... air conditioner, 93 ... information processing.

Notice

DESCRIPTION JPH10170293A

[0001]

13 INDUSTRIAL APPLICABILITY The present invention relates to a route search device for an electric vehicle, and in particular, provides a search method in consideration of the cruising power of the electric vehicle.

[0002]

19 PROBLEM TO BE SOLVED: To use a path search device for an automobile using an internal combustion engine as a traveling drive source to search a guided route from a starting point to a destination, which has already been put into practical use.

[0003]

25 PROBLEM TO BE SOLVED: To solve a problem. By the way, in general, an electric vehicle has a shorter cruising range than a vehicle having an internal combustion engine. If it is shorter than the distance, you will not be able to reach your destination.

[0004]

31 However, since the conventional route search device is not premised on being mounted on an electric vehicle, the cruising distance and charging time peculiar to the electric vehicle are not taken into consideration.

[0005]

37 An object of the present invention is to provide a route search device for an electric vehicle

that searches for an optimum guidance route to a destination in consideration of the cruising power of the electric vehicle.

[0006]

43 Means for Solving the Problems (1) The invention according to claim 1 is a road map data storage means for storing road map data including information about a charging station and a road map data including information about a charging station. Based on this, it is provided with a route search means for searching a guidance route to a destination in consideration of supplementary charging of an in-vehicle battery.

48 (2) The path search device for the electric vehicle according to claim 2 includes a remaining capacity detecting means for detecting the remaining capacity of the in-vehicle battery and a cruising distance calculating means for calculating the cruising distance based on the remaining capacity detection value. By the search means, route search is started for all routes including routes that do not go through the charging station, and if a route whose distance to the destination is smaller than the calculated cruising distance is searched, the required time is found among them. Alternatively, the route with the minimum required cost is selected as the guidance route.

56 (3) The path search device for the electric vehicle according to claim 3 passes through a charging station from the departure point to the destination when the search distance of all the routes under search exceeds the calculated cruising distance by the route search means. The route search is performed for the route.

60 (4) In the route search device for the electric vehicle according to claim 4, the distance from the departure point to the first charging station from the route of the search result is equal to or less than the cruising distance calculated value, and the first charge is performed by the route search means. Routes in which the distance between each charging station section from the station to the destination is less than or equal to the fully charged cruising distance are extracted as routes that can be traveled.

66 (5) The route search device for the electric vehicle according to claim 5 is based on the required power amount estimating means for estimating the required power amount in each charging station section on the travelable route and the required power amount estimated value in each charging station section. Then, from the charging stations on the travelable route, select the charging station that actually charges so that the number of supplementary charges from the departure point to the destination is the minimum and the charge amount for each supplementary charge is equal. It is provided with a charging point determining means for determining the charging point.

74 (6) The route search device for the electric vehicle according to claim 6 uses the required electric energy estimation means to estimate the required electric energy in consideration of the road gradient and the traffic congestion of the road. (7) The route search device for the electric vehicle according to claim 7 is a required power amount calculating means for calculating the required power amount between charging points based on the required power amount estimated value of each charging station section, and charging at each charging point.

The amount is provided with a charge amount setting means for setting a required power amount calculation value up to the next charging point. (8) The route search device for the electric vehicle according to claim 8 is such that the route search means selects the route having the minimum required time or cost from the routes that can be traveled as the guidance route. (9) In the route search device for the electric vehicle according to claim 9, the required time includes the charging time of the vehicle-mounted battery, and the required cost includes the charging cost of the vehicle-mounted battery.

[0007]

90 (1) According to the invention of claim 1, based on the road map data including the information about the charging station, the guidance route to the destination in consideration of the supplementary charging of the in-vehicle battery is searched. Therefore, even if the destination is far away, it is possible to search for a guidance route that takes into account the cruising power of the electric vehicle, and there is no need to investigate whether the occupants can reach the destination while performing supplementary charging themselves, and the destination is far away. You can give a sense of security when heading to.

97 (2) According to the invention of claim 2, the cruising distance is calculated based on the remaining capacity detection value of the in-vehicle battery, and the route search is started for all routes including the route that does not pass through the charging station. When a route whose distance to the ground is smaller than the calculated cruising distance is searched, the route with the minimum required time or cost is selected as the guided route, so the route that does not go through the charging station is included. From all the routes, it is possible to search for the optimum guidance route that can reach the destination without supplementary charging. (3) According to the invention of claim 3, when the search distance of all the routes under search exceeds the calculated cruising distance of the remaining battery capacity, the route from the departure point to the destination via the charging station is targeted. Since the route search is performed, the optimum route can be searched from all routes including the route that does not go through the charging station until the search distance exceeds the remaining capacity cruising distance, and the search distance is the remaining capacity. When the cruising distance is exceeded, the search for a route that does not go through an unnecessary charging station is omitted, and the route search time is shortened. (4) According to the invention of claim 4, the distance from the departure point to the first charging station is equal to or less than the calculated cruising distance of the remaining battery capacity from the path of the search result, and the distance from the first charging station to the destination Since the route where the distance of each charging station section up to is less than or equal to the fully charged cruising distance is extracted as a travelable route, it is possible to accurately search for a route that can reach the destination with the cruising power of the electric vehicle. can. (5) According to the invention of claim 5, the required power amount in each charging station section on the travelable route is estimated, and the charging on the travelable route is based on the estimated required power amount in each charging station section. From the stations, select the charging station that actually charges and determine the

charging point so that the number of supplementary charges from the departure point to the destination is the minimum and the charge amount for each supplementary charge is equal. Therefore, the supplementary charge can be started when the battery is almost empty, and the charging time for each supplementary charge can be shortened. (6) According to the invention of claim 6, since the required electric energy is estimated in consideration of the road gradient and the traffic congestion of the road, it is possible to estimate the required electric power accurately according to the road condition. (7) According to the invention of claim 7, the required power amount between charging points is calculated based on the estimated required power amount of each charging station section, and the charging amount at each charging point is added to the charging amount up to the next charging point. Since the calculated value of the required power amount during the period is set, the supplementary charge can be started from an almost empty state at the next charging point, and the charging time for each supplementary charge can be minimized.

135 (8) According to the invention of claim 8, since the route having the minimum required time or cost is selected as the guided route from the routes that can be traveled, the optimum guided route considering supplementary charging is selected. can do. (9) According to the invention of claim 9, since the required time includes the in-vehicle battery charging time and the required cost includes the in-vehicle battery charging cost, it is optimal considering the battery charging time and the charging cost. The guidance route can be selected.

[0008]

144 BEST MODE FOR CARRYING OUT THE INVENTION FIG. 1 is a block diagram showing a configuration of one embodiment.

146 The controller 1 is composed of a microcomputer and its peripheral parts, executes a control program described later to search for an optimum guidance route to a destination, displays the current location and the guidance route on a road map, and guides an occupant. A direction sensor 2, a distance sensor 3, a GPS receiver 4, a storage device 5, an input device 6, and a fuel gauge 7 are connected to the controller 1. The azimuth sensor 2 detects the traveling direction of the vehicle, and the distance sensor 3 detects the mileage of the vehicle. The GPS receiver 4 receives a GPS signal from a satellite and detects the current location, traveling direction, traveling speed, and the like of the vehicle. Further, the storage device 5 is a device such as a CD-ROM that stores road map data. This road map data contains information about the charging station, such as the location of the charging station. Further, the input device 6 is a device for setting a destination and the like, and the fuel gauge 7 detects the remaining capacity of the in-vehicle battery (not shown). Since various methods have already been proposed for detecting the remaining capacity of the battery, the description thereof will be omitted here. The controller 1 is also connected to a display 8 for displaying a road map and text information, a speaker 9 for performing voice guidance, and the like.

[0009]

165 In this embodiment, in the route from the charging station to the charging station, not only the distance but also the uphill, downhill, and traffic jams on the route are taken into consideration to estimate the required power amount and calculate the running time and charging time. Then, search for the guidance route with the minimum required time and cost to reach the destination.

170 The time required to reach the destination includes the charging time at the charging station in addition to the actual travel time of the route, and the required cost to the destination includes the charging fee and the toll road fee. Further, in this specification, among the charging stations on the route, the position of the charging station that actually performs supplementary charging is referred to as a charging point.

[0010]

178 In general, the closer the battery is to a fully charged state, the smaller the amount of charge per hour (the amount of rechargeable power), and the closer to the empty state, the larger the amount of charge per hour.

181 Therefore, in order to minimize the charging time, it is better to drive and charge the battery until it is as close to empty as possible, rather than frequently stopping by the charging station to charge the battery. Therefore, in this embodiment, the interval between supplementary charges is made as long as possible to reduce the number of supplementary charges to the destination, and the amount of supplementary charges at each charging point is equalized from the charging stations on the route. Select a charging station to stop by and decide on a charging point.

[0011]

191 FIG. 2 is a flowchart showing a route search process.

192 The operation of one embodiment will be described with reference to this flowchart. The controller 1 executes this process when the destination is set by the input device 6 and the route search instruction operation is performed. First, the destination set by the input device 6 is read in step 1, and in the following step 2, the remaining capacity of the battery is confirmed by the fuel gauge 7, and the cruising distance that can be traveled by the remaining capacity is calculated.

[0012]

201 In step 3, a route search from the departure point to the destination is performed by targeting all routes including the route that does not pass through the charging station.

203 In general, an electric vehicle is inferior in cruising power to an internal combustion engine vehicle, so if the mileage to the destination is long, it is necessary to travel on a route with a charging station. However, if the distance to the destination is short and the current

remaining capacity is reachable, there is no problem in traveling on a route without a charging station. Therefore, in order to investigate whether or not the destination can be reached with the current remaining capacity, the route search to the destination is started by targeting all the routes including the route that does not pass through the charging station. As a route search method to the destination, for example, the Dijkstra method can be used, and since these are already well known, the description thereof will be omitted.

[0013]

In step 4, during the route search for all routes including the route that does not go through the charging station, the search distance in all the routes in the middle of the search, that is, from the starting point to the search node (intersection, road bend, etc.). Check if the distance exceeds the cruising range of the remaining capacity.

If the search distance of all the routes in the middle of the search exceeds the cruising distance of the remaining capacity, it is useless to search the route for all the routes any more, so proceed to step 5 and go through the charging station. Performs a route search targeting only the route to be searched. In the following step 6, it is confirmed whether or not a route that can reach the destination has been searched while performing supplementary charging, and if the guidance route is searched, the process proceeds to step 7, and the current location of the vehicle and the searched guidance route are displayed on the road map. The charging point, charging time, time required to reach the destination, etc. are displayed. However, if the distance between the charging station and the charging station on the route exceeds the cruising distance of full charge and the guidance route that can travel to the destination cannot be searched, the process proceeds to step 10 and the display 8 is used for the purpose. A warning message indicating that the area cannot be reached is displayed.

[0014]

In this way, when the search distance of all the routes under search exceeds the calculated cruising distance of the remaining battery capacity, the route search is performed for the route via the charging station from the departure point to the destination. Therefore, it is possible to search for the optimum route from all routes including routes that do not go through the charging station until the search distance exceeds the cruising distance of the remaining capacity, and it is unnecessary if the search distance exceeds the cruising distance of the remaining capacity. The search for a route that does not go through a simple charging station is omitted, and the route search time is shortened.

[0015]

On the other hand, if the search distance is less than or equal to the cruising distance, the process proceeds to step 8 to confirm whether or not a route that can reach the destination

without supplementary charging has been searched.

249 If a route that can reach the destination without supplementary charging is searched for, proceed to step 9, select the route with the minimum required time or cost from the search routes as the guidance route to the destination, and use the road map. The guidance route is displayed above, and the time required to reach the destination is displayed.

253 Here, the time required to reach the destination without supplementary charging is only the required traveling time of the route, for example, the traveling time when traveling on the route at the legal speed, or VICS (Vehicle Information and Communication System) at the legal speed.), The travel time is calculated in consideration of traffic congestion information and traffic regulation information. If the route to the destination has not been searched in step 8, the process returns to step 4 and the route search for all routes including the route that does not pass through the charging station is continued.

[0016]

263 In this way, the cruising distance is calculated based on the remaining capacity detection value of the in-vehicle battery, the route search is started for all routes including the route that does not pass through the charging station, and the distance to the destination is calculated as the cruising distance. When a route smaller than the value is searched, the route with the minimum required time or cost is selected as the guided route, so that all routes including the route that does not go through the charging station are supplemented. It is possible to search for the optimum guidance route that can reach the destination without charging.

[0017]

274 FIG. 3 is a flowchart showing a route search process via the charging station executed in step 5 of FIG.

276 In step 21, the route via the charging station is searched.

277 The road map data stored in the storage device 5 includes information about the charging station, and searches for a route via the charging station based on the position information of the charging station. At this point, the route search for all routes including the route that does not go through the charging station is performed halfway, so only the route with the charging station on the route is extracted from the routes in the middle of the search. , You can continue to search for those routes.

[0018]

286 FIG. 4 shows an example of a route from a starting point to a destination via a charging station.

288 The circles in the figure indicate the location of the charging station. In this embodiment, each route to the destination via the charging station is represented by the number i (= 1, 2, ...) In

order, and each charging station on each route is represented by the number j (= 1, 2, ...) In order. , ...). Then, the charging station of the number j on the path i is represented as Sij. In the example of FIG. 4, the charging stations S11, S12, and S13 are on the path 1, and the charging stations S21 and S22 are on the path 2. Further, there are charging stations S31, S32, and S33 on the path 3. It should be noted that some charging stations overlap in a plurality of routes. Further, in the example shown in FIG. 4, the charging stations S13 and S22 are at the intersection of the road, and the other charging stations are not at the intersection.

[0019]

301 In step 22, the route number i is set to 1, and in the following step 23, the charging station number j is set to 1 to confirm whether or not each route of the search result via the charging station can be traveled.

304 First, in step 24, the required electric energy from the departure point to the nearest charging station Si1 on the route i is estimated. The method for estimating the required electric energy will be described later. In step 25, it is confirmed whether or not the battery can travel to the nearest charging station Si1 with the current remaining capacity of the battery. If the distance to the nearest charging station Si1 exceeds the cruising range of the current remaining capacity, it is not possible to travel on this route i, so it is useless to continue searching for route i, and step. Proceed to 29. In step 29, it is confirmed whether or not the investigation of all routes has been completed, and if there is an uninvestigated route, the process proceeds to step 30, the route number i is incremented, and the process returns to step 22 to investigate the next route (i + 1).

[0020]

317 In addition, for example, when the departure place is a home or a charging station where a charging device is installed and it is assumed that the departure is always in a fully charged state, the processes of steps 23 to 25 are unnecessary.

320 Therefore, after the process of step 22, for example, the open terminal voltage of the battery is detected to determine whether or not the battery is in a fully charged state, and if it is in a fully charged state, the processes of steps 23 to 25 are omitted and the process proceeds to step 26. If the battery is not fully charged, the processes of steps 23 to 25 may be performed.

[0021]

328 In step 26, can all other charging station sections on the route i, except the section from the departure point to the first charging station Si1, be fully charged, that is, the distance of all charging station sections is the fully charged cruising range. Check if it is as follows.

331 If any of the charging station sections on the route i cannot travel on a full charge, the route i

is regarded as untravelable and the process proceeds to step 29. On the other hand, when all the other charging station sections on the route i other than the first charging station section can travel on a full charge, the route i is a travelable route and the process proceeds to step 27.

[0022]

339 In this way, the distance from the departure point to the first charging station in the search result route is less than or equal to the calculated cruising distance of the remaining battery capacity, and the distance between each charging station section from the first charging station to the destination. Since the route that is less than the cruising distance of a full charge is extracted as a travelable route, it is possible to accurately search for a route that can reach the destination with the cruising power of the electric vehicle.

[0023]

348 In step 27, the required electric energy of each charging station section on the path i is estimated.

350 For example, in the route 1 shown in FIG. 4, the required electric energy of each section from the departure point to S11, S11 to S12, S12 to S13, and S13 to the destination is estimated.

352 In addition, routes 2 and 3 are estimated in the same manner. The method for estimating the required electric energy will be described later.

[0024]

357 In step 28, the station to be actually charged is selected from the charging stations Si1, Si2, ... On the path i, and the charging point is determined.

359 Here, the charge amount at a certain charging point is the required electric energy to the next charging point, and the required electric energy between the charging points is the sum of the required electric energy of the charging station section included in the section. As mentioned above, when selecting a charging station, make the supplementary charging interval as long as possible to reduce the number of supplementary charging from the charging stations from the departure point to the destination so that the supplementary charging amount at each charging point is even. Select to.

[0025]

369 In this way, the required power amount in each charging station section on the travelable route is estimated, and based on the estimated required power amount in each charging station section, the charging stations on the travelable route are selected from the starting point. Since the charging station to actually charge is selected and the charging point is determined so that the number of supplementary charges to the destination is the minimum

and the amount of charge for each supplementary charge is equal, the battery is almost empty. Supplementary charging can be started from, and the charging time for each supplementary charging can be shortened.

[0026]

380 When the investigation of all routes i is completed, the process proceeds to step 31, the charging time and the charging charge for each route that can reach the destination are estimated, and the required time for each route is calculated in the following step 32.

383 The estimation of the charging time will be described later.

384 The charging time and charge charge estimation for each route and the calculation of the required time may be performed during the search for each route, but it is clear whether the search process for each route is completed and the destination can be reached. It is more rational to do it after that, and it is possible to eliminate unnecessary processing for routes that cannot reach the destination. In step 33, the route with the minimum required time or the route with the minimum required cost is selected as the optimum guidance route from the search routes that can reach the destination.

[0027]

394 Here, a method of estimating the required electric energy in a certain section will be described.

396 As shown in FIG. 5, in the section from one charging station Sij on a certain route to the next charging station Si (j + 1), the distance from the charging station Sij at the point X is defined as x. Further, the estimated vehicle speed at the point X is v [km / h]. The vehicle speed v may be estimated in consideration of traffic information such as VICS in addition to the legal speed, or 10-15 mode or HWY mode according to the type of road, such as city driving, suburban general road driving, or highway driving. It may be estimated by applying a driving mode such as.

[0028]

406 The power consumption rate N [Wh / km] when traveling at the point X is expressed by the following equation.

408 [Equation 1] N (during power running) = K / (eg · em) + W / v, N (during regeneration) = K · egg · em + W / v K in the formula 1 is expressed by the following equation. In Equation 1 and Equation 2, θ is the road gradient [%] at point X. Wt is the vehicle weight [kg], Wi is the rotational inertia equivalent weight [kg], μ is the rolling resistance coefficient, Cd is the air resistance coefficient, A is the front projected area [m2], and eg is the gear efficiency [%/ 100]. , Em are motor efficiencies [%/ 100], which are vehicle-specific values. The egg and em are determined by the vehicle speed and torque. Further, g is the gravitational acceleration [m / sec2], and ρ is the air density [kg / m3]. W is an auxiliary load [W] for an air

conditioner, a radio, or the like.

[0029]

420 The required electric energy E [Wh] from the charging station Sij to the next charging station Si (j + 1) is the power consumption rate N [Wh / km] expressed by the formula 1 as the distance xo [km] between the charging stations. Because you just have to integrate

[0030]

426 As described above, since the required power amount is estimated in consideration of the road gradient and the traffic congestion of the road, it is possible to estimate the required power accurately according to the road condition.

[0031]

432 Next, a method of estimating the charging time will be described.

433 The required electric energy E [Wh] between charging points is calculated based on the estimated required electric energy of each charging station section, and the required electric energy calculated value E up to the next charging point is added to the charging amount at each charging point. Set [Wh].

437 That is, the charge amount at each charging point is E [Wh].

438 As a result, at the next charging point, supplementary charging can be started from an almost empty state, and the charging time for each supplementary charging can be minimized. The internal resistance r [Ω] and the open circuit voltage Vo [V] of the battery can be expressed by an approximate expression of an experimental formula obtained experimentally as a function of the charge amount E. [Equation 4] r = r (E) = re + k1E + k2E2 + k3E3 + ..., Vo = Vo (E) = Ve + h1E + h2E2 + h3E3 + ... Here, re and Ve are the internal resistance and the open circuit voltage at the time of complete discharge.

[0032]

448 FIG. 6 is a diagram showing the rechargeable power characteristics of the battery.

449 Assuming that the upper limit voltage of the battery is Vt, the rechargeable power P can be expressed as P (E) = Vt {Vt-Vo (E)} / r (E), Vt = Vo (Et). By charging with chargeable power determined by the upper limit voltage Vt of the battery, it is possible to charge in the minimum time. Therefore, the time t [h] when charging from E to E'shown in FIG. 6 is obtained by the following equation. In this way, the charging time can be estimated based on the data of the internal resistance, the open circuit voltage and the upper limit voltage of the battery.

[0033]

459 As explained above, based on the road map data that includes information about the charging station, the guidance route to the destination is searched for in consideration of supplementary charging of the in-vehicle battery, so even if the destination is far away. It is possible to search for a guidance route that takes into account the cruising power of the electric vehicle, and it is not necessary for the occupants to investigate whether they can reach the destination while performing supplementary charging, which gives a sense of security when heading to a distant destination. ..

466 In addition, since the time required to reach the destination includes the charging time of the in-vehicle battery and the required cost includes the charging cost of the in-vehicle battery, the optimum guidance route should be selected in consideration of the charging time of the battery and the charging cost. Can be done.

[0034]

473 In the configuration of the above embodiment, the storage device 5 is a road map data storage means, and the controller 1 is a route search means, a cruising distance calculation means, a required electric energy estimation means, a charging point determining means, a required electric energy calculation means, and charging. The amount setting means and the remaining amount meter 7 constitute the remaining capacity detecting means.

[0035]

481 A brief description of the drawing

[0036]

485 FIG. 1 is a diagram showing a configuration of one embodiment.

[0037]

489 FIG. 2 is a flowchart showing a route search process according to the embodiment.

[0038]

493 FIG. 3 is a flowchart showing a route search process via the charging station of the embodiment.

[0039]

498 FIG. 4 is a diagram showing an example of a route from a starting point to a destination via a charging station.

[0040]

503 FIG. 5 is a diagram illustrating a method of estimating a required electric energy in a certain charging station section.

[0041]

508 FIG. 6 is a diagram showing the rechargeable power characteristics of the battery.

[0042]

512 Description of the sign

[0043]

516 1 Controller 2 Direction sensor 3 Distance sensor 4 GPS receiver 5 Storage device 6 Input device 7 Remaining meter 8 Display 9 Speaker

Notice

DESCRIPTION JP2006298262A

Vehicle air conditioner

[0001]

The present invention relates to a vehicle air conditioner, and more particularly to a vehicle air conditioner that pre-air-conditions a vehicle before an occupant gets on the vehicle.

[0002]

Conventionally, as an air-conditioning device for air-conditioning the interior of a hybrid vehicle using an engine and an electric motor as a drive source, a compressor is driven by electric power from a battery in order to air-condition the interior of the vehicle even when the engine is stopped. There is something that air-conditions the room. In such an air conditioner, it is necessary to control the battery so as not to be over-discharged.

[0003]

Therefore, in Patent Document 1, when the compressor of the refrigeration cycle is driven by the motor, at least one of the capacities of the blower and the compressor is lowered as compared with the case where the compressor is driven by the engine, and further, the cooling of the evaporator is further reduced. A device for reducing power consumption by giving priority to reducing the capacity of the compressor when the heat load is large is described.

[0004]

Further, Patent Document 2 describes a device that detects a power generation state of an electric motor driven by an engine and limits the output to an electric compressor to a predetermined value or less when the amount of power generation is insufficient.

[0005]

41 Further, Patent Document 3 describes a device for limiting the rotation speed of the electric compressor while the vehicle is stopped.

[0006]

46 Further, Patent Document 4 describes an apparatus for operating an electric compressor by holding operation efficiency data relating to a rotation speed with good operation efficiency of the electric compressor and determining a time to start the electric compressor based on the operation efficiency data. Has been done. 特開２００１－１８０２６０号公報 特開２０００－２３２７９９号公報 特開２００２－２３７３５６号公報 特開２００３－２３７３５１号公報

[0007]

55 By the way, in recent years, a technique has been proposed in which the interior of a vehicle is pre-air-conditioned before the occupant gets on board to improve the comfort when the occupant gets on board. For example, when the cooling operation is performed as pre-air conditioning before getting on a vehicle that has been stopped for a long time in midsummer, the heat load becomes very large because the temperature inside the vehicle is high. Therefore, in order to obtain the maximum cool-down performance, pre-cooling may be performed by setting the rotation speed of the electric compressor to the maximum rotation speed and setting the blower fan voltage to the maximum voltage.

[0008]

66 However, when pre-cooling is performed in this way, the power consumption is too large, and even if the battery capacity is sufficient, the operating time becomes extremely short.

68 In addition, even if the temperature at which the air is blown out from the air outlet is lowered, if the operating time is short, the heat capacity of the occupant's seat cannot be sufficiently taken, and the feeling when riding cannot be improved. There is.

[0009]

74 The present invention has been made in consideration of the above facts, and provides an air conditioner for a vehicle capable of suppressing power consumption and improving the feeling when riding when a large heat load is applied. With the goal.

[0010]

80 In order to achieve the above object, the invention according to claim 1 is at least one of the temperature and the air volume of the air blown out from the air outlet provided in the passenger compartment of the vehicle by the electric power supplied from the charged power storage means. The adjusting means for adjusting the temperature, the vehicle interior temperature detecting means for detecting the temperature inside the vehicle, the surface temperature detecting means for detecting the surface temperature of the portion where the occupant comes into contact during the occupancy, and the vehicle before the occupant gets on the vehicle. It is characterized by comprising a control means for operating the adjusting means with a capacity set based on the temperature inside the vehicle interior and the surface temperature when the execution of pre-air conditioning for air-conditioning the room is instructed. ..

[0011]

94 According to the present invention, the adjusting means operates by the electric power supplied from the charged power storage means, and adjusts at least one of the temperature and the air volume of the air blown from the air outlet provided in the passenger compartment of the vehicle. do.

[0012]

101 The control means was detected by the vehicle interior temperature detection means and the surface temperature detection means detected by the vehicle interior temperature detection means when instructed to perform pre-air conditioning to air-condition the vehicle interior before the occupant boarded. Based on the surface temperature of the part that the occupant comes into contact with while riding, the capacity of the adjusting means is set, and the adjusting means is operated with the set capacity.

[0013]

110 For example, as described in claim 2, in the control means, the absolute value of the difference between the temperature inside the vehicle interior and the target vehicle interior temperature is equal to or higher than the first threshold value, and the surface temperature and the target surface temperature are the same. When the absolute value of the difference satisfies the condition of the second threshold value or more, the adjusting means is operated with the first capacity lower than the maximum capacity of the adjusting means, and when the condition is not satisfied, the first capacity is not satisfied. The adjusting means is operated with a second capacity higher than the capacity of one.

[0014]

121 That is, when the heat load is large, the capacity is reduced and the adjusting means is

operated, so that the power consumption can be suppressed.

123 Therefore, since the operating time of the pre-air conditioning can be lengthened, for example, when the cooling operation is performed as the pre-air conditioning, an appropriate cool-down performance can be obtained, and the feeling when riding can be improved. ..

[0015]

129 Specifically, as described in claim 3, the adjusting means includes a compressor and a blower fan operated by the electric power supplied from the storage means, and the controlling means is satisfied when the above conditions are satisfied. The compressor is operated at a first rotation speed lower than the maximum rotation speed, and the blower fan is operated at a first air volume smaller than the maximum air volume. If the above conditions are not satisfied, the first rotation speed is operated. The compressor can be operated at a higher second rotation speed, and the blower fan can be operated at a second air volume larger than the first air volume.

[0016]

140 Further, as described in claim 4, the second rotation speed may be the maximum rotation speed, and the second air volume may be the maximum air volume.

142 As a result, the interior of the vehicle can be air-conditioned in a shorter time.

[0017]

146 Further, as described in claim 5, the portion with which the occupant comes into contact may be configured to be a seat on which the occupant sits.

148 As a result, the feeling when the occupant is seated can be improved.

[0018]

152 Further, as described in claim 6, the detection means for detecting the amount of electricity stored in the electricity storage means is further provided, and the control means is the pre-conditioning means when the amount of electricity stored in the detection means is equal to or less than a predetermined amount. The operation of the air conditioner may be stopped.

156 As a result, it is possible to prevent the storage amount of the storage means from being excessively reduced.

[0019]

161 As described above, according to the present invention, there is an effect that power consumption can be suppressed and a feeling when riding can be improved when the heat load is large.

[0020]

167 Hereinafter, an example of an embodiment of the present invention will be described in detail with reference to the drawings.

[0021]

172 FIG. 1 shows a schematic configuration of a vehicle air conditioner 10 according to an embodiment of the present invention.

174 As shown in FIG. 1, the vehicle air conditioner 10 is provided with a refrigerant circulation path including a compressor 12 as a compressor, a condenser 14 as a condenser, an expansion valve 16 as a decompressor, and an evaporator 18 as an evaporator. A refrigeration cycle is configured.

[0022]

181 The compressor 12 is an electric compressor and is driven by an electric motor 70 (see FIG. 2).

183 The compressor 12 is operated by rotationally driving the electric motor 70. The compressor 12 compresses the low pressure gas phase refrigerant into a high temperature and high pressure superheated gas phase refrigerant.

[0023]

189 As the compressor 12, various types of compressors can be applied, but here, it is assumed that a conventionally known variable displacement compressor is applied.

191 In such a compressor 12, the solenoid valve 20 is controlled by changing the current value of the energizing current to the solenoid valve 20 (see FIG. 2) of the compressor 12 or changing the duty ratio, and the piston of the compressor 12 is used. By changing the stroke of, the suction pressure of the refrigerant can be changed. As a result, the amount of refrigerant circulating by the compressor 12, that is, the cooling capacity is adjusted.

[0024]

199 The condenser 14 is a heat exchanger between the refrigerant and the outside air arranged downstream of the compressor 12, and cools and condenses the superheated air phase refrigerant discharged from the compressor 12 into a liquid phase refrigerant.

202 The liquid phase refrigerant flowing out of the capacitor 14 is depressurized by the expansion valve 16 to become a low pressure liquid phase.

[0025]

207 The expansion valve 16 provided on the upstream side of the evaporator 18 rapidly decompresses the liquefied refrigerant to atomize it and supply it to the evaporator 18.

209 This makes it possible to improve the vaporization efficiency of the refrigerant in the evaporator 18.

[0026]

214 The evaporator 18 is a heat exchanger that evaporates a low-pressure liquid-phase refrigerant into a low-pressure gas-phase refrigerant, and the air that passes through the evaporator 18 (hereinafter, after the evaporator) is vaporized by the compressed and liquefied refrigerant. Cool the air).

218 At this time, the evaporator 18 is designed to condense moisture in the air by cooling the passing air, whereby the air after the evaporator is dehumidified.

[0027]

223 The evaporator 18 is provided inside the air conditioning duct 22.

224 Both ends of the air conditioning duct 22 are open, and air intake ports 24 and 26 are formed at one of the open ends. Further, at the other opening end, a plurality of air outlets 28 (28A, 28B, 28C are shown as an example in the present embodiment) formed toward the vehicle interior.

[0028]

231 The air intake 24 communicates with the outside of the vehicle, and outside air can be introduced into the air conditioning duct 22.

233 Further, the air intake port 26 communicates with the vehicle interior, and the air (inside air) in the vehicle interior can be introduced into the air conditioning duct 22. As an example of the air outlet 28, the air outlet 28A is a defroster outlet that blows air toward a windshield glass (not shown) of the vehicle, and the air outlet 28B is a side and center register outlet. It is a mouth, and the air outlet 28C is a foot outlet.

[0029]

241 In the air conditioning duct 22, a blower fan 30 is provided between the evaporator 18 and the air intakes 24 and 26.

243 Further, an air intake switching damper 32 is provided in the vicinity of the air intakes 24 and 26. The air intake switching damper 32 opens and closes the air intakes 24 and 26 by operating an actuator such as a servomotor 34 (see FIG. 2).

[0030]

249 The blower fan 30 is rotated by the drive of the blower motor 36, sucks air into the air conditioning duct 22 from the air intake port 24 to the air intake port 26, and further sends the air toward the evaporator 18.

252 At this time, outside air or inside air is introduced into the air conditioning duct 22 according to the open / closed state of the air intakes 24 and 26 by the air intake switching damper 32.

[0031]

257 That is, when the air intake switching damper 32 closes the air intake 24, the inside air circulation mode is set in which the inside air is introduced into the air conditioning duct 22, and when the air intake switching damper 32 closes the air intake 26, the inside air circulation mode is set. , The outside air introduction mode is set in which the outside air is introduced into the air conditioning duct 22.

[0032]

265 An air mix damper 38 and a heater core 40 are provided on the downstream side of the evaporator 18.

267 The air mix damper 38 is rotated by the drive of the servomotor 42 (see FIG. 2), and adjusts the amount of air passing through the heater core 40 after the evaporator 18 and the amount of bypassing the heater core 40.

[0033]

273 A cooling water circulation path is formed in the heater core 40 with the engine of a vehicle (not shown), and the cooling water circulates in the heater core 40 by the operation of a circulation pump (not shown).

276 As a result, the air passing through the heater core 40 is heated by the cooling water heated by the engine.

[0034]

281 Therefore, the air heated by the heater core 40 and the air cooled by the evaporator 18 by bypassing the heater core 40 are mixed, and the mixed air is blown out from the air outlet 28 as air conditioning air.

284 At this time, in the vehicle air conditioner 10, the opening degree of the air mix damper 38 is controlled to adjust the amount of air passing through the heater core 40 and air bypassing the heater core 40, thereby moving from the air outlet 28 to the vehicle interior. Adjust the temperature of the air blown toward it.

[0035]

291 An air outlet switching damper 44 is provided in the vicinity of the air outlet 28.

292 In the vehicle air conditioner 10, the temperature-controlled air can be blown out from a desired position into the vehicle interior by opening and closing the air outlets 28A, 28B, and 28C by the air outlet switching dampers 44.

295 The operation of the air outlet switching damper 44 will be described as assuming that the servomotor 46 is driven by the vehicle air conditioner 10 according to the set operation mode, but the occupant mechanically operates the air manually. It may be one that can open and close the outlet 28.

[0036]

302 Next, the configuration of the control system of the vehicle air conditioner 10 according to the present embodiment will be described.

304 FIG. 2 shows a schematic block diagram of the control system of the vehicle air conditioner 10 according to the present embodiment.

[0037]

309 The vehicle air conditioner 10 includes an air conditioner control unit 50 composed of a microcomputer including a ROM, a RAM, a CPU, and the like (not shown).

[0038]

314 The air conditioning control unit 50 receives suction pressure of a servo motor 34 for driving an air intake / inlet switching damper 32, a servo motor 42 for driving an air mix damper 38, a servo motor 46 for driving an air outlet switching damper 44, and a compressor 12. An electromagnetic valve 20 for controlling, an electric motor 70 for driving the compressor 12, and a blower motor 36 for driving the blower fan 30 are connected to each other.

[0039]

322 Further, in the air conditioning control unit 50, along with setting the target vehicle interior temperature, the air volume of the blower fan 30, the air intake port, the air outlet, etc. are set in the manual mode or the auto mode, the outside air introduction mode or the inside air. An operation panel 54 for setting an operation mode (air conditioning condition) such as setting of an air outlet 28 for blowing out temperature-controlled air or performing in a circulation mode is connected.

328 The vehicle air conditioner 10 operates based on the air conditioning conditions set by the occupant by operating the operation panel 54.

330 The air conditioning conditions set by the occupants are stored in the memory 66 described later.

[0040]

335 Further, the vehicle air conditioner 10 includes a post-evaporator temperature sensor 56 that detects the temperature of the air after the evaporator (hereinafter referred to as the temperature after the evaporator), an outside air temperature sensor 58 that detects the outside air temperature outside the vehicle, and a temperature inside the vehicle. A vehicle interior temperature sensor 60, a solar radiation sensor 62, a receiver 64, for example, a non-volatile memory 66 such as a flash ROM, a seat surface temperature sensor 68 for detecting the surface temperature of a seat on which an occupant (not shown) is seated, and a vehicle. SOC (State of Charge) sensors 69 for detecting the remaining capacity (storage amount) of the battery 71 are provided, and these are connected to the air conditioning control unit 50, respectively.

[0041]

348 The post-evaporator temperature sensor 56 is composed of, for example, a thermistor or the like, senses the temperature of the air after the evaporator as a resistance change, and outputs a post-evaporator temperature signal according to the temperature of the air after the evaporator to the air conditioning control unit 50.

352 The post-evaporator temperature sensor 56 is installed at the rear of the evaporator 18.

[0042]

356 The outside air temperature sensor 58 is composed of, for example, a thermistor or the like, senses the outside air temperature as a resistance change, and outputs an outside air temperature signal corresponding to the outside air temperature to the air conditioning control unit 50.

360 The outside air temperature sensor 58 is installed, for example, in the lower part of the front bumper reinforcement of the vehicle.

[0043]

365 The vehicle interior temperature sensor 60 is composed of, for example, a thermistor or the like, senses the temperature inside the vehicle interior as a resistance change, and outputs a vehicle interior temperature signal corresponding to the vehicle interior temperature to the air conditioning control unit 50.

369 The vehicle interior temperature sensor 60 is installed at a predetermined position, for example, in the instrument panel of the vehicle.

[0044]

374 The solar radiation sensor 62 is configured by a photodetecting means such as a photodiode, and outputs a solar radiation amount signal according to the solar radiation amount to the air conditioning control unit 50.

377 The solar radiation sensor 62 is installed near the defroster outlet at the upper part of the instrument panel of the vehicle, for example.

[0045]

382 The receiving unit 64 receives various signals transmitted from the remote control key 80 of the vehicle as shown in FIG.

[0046]

387 The seat surface temperature sensor 68 is composed of, for example, a thermistor or the like, senses the surface temperature of the seat on which the occupant sits as a resistance change, and outputs a seat surface temperature signal according to the seat surface temperature to the air conditioning control unit 50.

391 The seat surface temperature sensor 68 is provided on at least one of the seat back and the seat cushion, and is provided at a portion where at least a part of the occupant's body reliably contacts when the occupant sits down.

[0047]

397 As shown in FIG. 3A, the remote control key 80 has a configuration in which the grip portion 84 is attached to the key portion 82 inserted into the key insertion slot of the vehicle.

399 The grip portion 84 is provided with a lock button 86 for locking the vehicle door, an unlock button 88 for unlocking the vehicle door, and a pre-air conditioning button 90 for instructing execution of pre-air conditioning described later. Has been done.

[0048]

405 FIG. 3B shows a block diagram of the control system of the remote controller key 80.

406 As shown in FIG. 3B, the remote control key 80 has a lock button 86, an unlock button 88, a pre-air conditioning button 90, and a lock button 86, an unlock button 88, and a pre-air conditioning button 90 on a control unit 92 composed of a microcomputer including a ROM, a RAM, a CPU, etc. (not shown). And the transmission unit 94 are connected to each other.

[0049]

413 When the lock button 86 is pressed, the control unit 92 wirelessly transmits a lock signal indicating that the lock button 86 is pressed by the transmission unit 94.

415 When this signal is received on the vehicle side, the vehicle door is locked.

416 Similarly, when the unlock button 88 is pressed, the control unit 92 wirelessly transmits an unlock signal indicating that the unlock button 88 is pressed by the transmission unit 94.
418 When this signal is received on the vehicle side, the vehicle door is unlocked.

[0050]

422 Further, when the pre-air conditioning button 90 is pressed, the control unit 92 wirelessly transmits a pre-air conditioning signal indicating that the pre-air conditioning button 90 is pressed by the transmission unit 94.
425 When this signal is received on the vehicle side, the pre-air conditioning control described later is executed.

[0051]

430 In the air conditioning control unit 50, when the air conditioning conditions including the target vehicle interior temperature are set during normal air conditioning operation, the air conditioning conditions and the environmental conditions (outside air temperature, vehicle interior temperature, solar radiation amount, etc.) are set. Based on this, the air conditioning inside the vehicle is controlled.

[0052]

438 For example, when the auto mode is set, the target blowing temperature (the target temperature of the air blown from the air outlet) for setting the inside of the vehicle as the target vehicle interior temperature based on the target vehicle interior temperature and the environmental conditions.), The opening degree of the air mix damper 38, the blower level (air volume of the blower fan 30), the air intake port, the air outlet, etc. are set, and the suction pressure of the compressor 12 (capacity of the compressor 12) is based on the setting results. , The blower fan 30, the air intake / inlet switching damper 32, the air mix damper 38, the air outlet switching damper 44, and the like are controlled to control the motors and the like to air-condition the interior of the vehicle.

[0053]

450 The target blowout temperature TAO can be generally calculated from the target vehicle interior temperature TSET, the vehicle interior temperature TR, the outside air temperature TAM, and the amount of solar radiation TS by using the following equation.

[0054]

456 TAO = k1, TSET-k2, TR-k3, TAM-k4, TS + C ... (1) (However, k1, k2, k3, k4, and C are preset constants) Also, manual mode (auto mode off) is available. If it is set, the target blowout

temperature, the opening degree of the air mix damper 38, etc. are set based on the target vehicle interior temperature and the environmental conditions, and the air intake port selected by this setting and the operation of the operation panel 54, Motors that drive the suction pressure of the compressor 12, the blower fan 30, the air intake / inlet switching damper 32, the air mix damper 38, the air outlet switching damper 44, etc., based on the air conditioning conditions such as the air outlet and the blower level. By controlling the air conditioning inside the vehicle interior.

[0055]

468 Further, when the reception unit 64 receives the pre-air conditioning signal transmitted from the remote control key 80 in a state where the occupant is not in the vehicle, the air-conditioning control unit 50 executes the pre-air-conditioning control described later.

471 In this pre-air conditioning control, the interior of the vehicle is air-conditioned before the occupant gets on the vehicle, and the comfort when the occupant gets on the vehicle is improved.

[0056]

477 Next, as the operation of the present embodiment, the pre-air conditioning (pre-cooling) control routine performed by the air conditioning control unit 50 will be described with reference to the flowchart shown in FIG.

480 In the pre-air conditioning control routine shown in FIG. 4, the occupant presses the pre-air conditioning button 90 of the remote control key 80 within the detection range of the signal output from the remote control key 80, and the pre-air conditioning signal transmitted from the remote control key 80 is transmitted. It is executed when it is received normally.

[0057]

487 First, in step 100, the target vehicle interior temperature stored in the memory 66 is read out, and in step 102, the vehicle interior temperature signal output from the vehicle interior temperature sensor 60 is taken in, and the seat output from the seat surface temperature sensor 68 is taken in. Capture the surface temperature signal.

[0058]

494 In step 104, it is determined whether or not the discrepancy between the detected vehicle interior temperature and the target vehicle interior temperature is large.

496 That is, it is determined whether or not the difference between the detected vehicle interior temperature and the target vehicle interior temperature (value obtained by subtracting the target vehicle interior temperature from the detected vehicle interior temperature) is equal to or greater than the first threshold value.

500 When the difference is equal to or greater than this value, the first threshold value is set to a value at which it can be determined that the heat load is large and the power consumption of the compressor or the like is relatively high.

503 For example, the average target vehicle interior temperature that passengers feel comfortable is set to about 25 degrees, and considering that the vehicle interior temperature will be 60 degrees or more when the vehicle is left in the scorching sun for a long time, the first The threshold value is set to a value in the range of 40 degrees to 60 degrees as an example.

507 In the present embodiment, the target vehicle interior temperature uses a temperature set by the occupant, but may be a predetermined fixed value (for example, 25 degrees).

[0059]

512 Then, when the difference between the detected vehicle interior temperature and the target vehicle interior temperature is equal to or greater than the first threshold value, the process proceeds to step 106.

515 On the other hand, when the difference between the detected vehicle interior temperature and the target vehicle interior temperature is less than the first threshold value, the process proceeds to step 112, and the rotation speed of the compressor 12 is set to the maximum rotation speed (second rotation speed). Set.

519 That is, the cooling capacity is set to the maximum.

520 Next, in step 114, the drive voltage for driving the blower fan 30 is set to the maximum voltage.

522 That is, the air volume of the blower fan 30 is set to the maximum air volume (second air volume).

[0060]

527 In step 106, it is determined whether or not the discrepancy between the detected sheet surface temperature and the target sheet surface temperature is large.

529 That is, it is determined whether or not the difference between the detected sheet surface temperature and the target sheet surface temperature (the value obtained by subtracting the target sheet surface temperature from the detected sheet surface temperature) is equal to or greater than the second threshold value. When the difference is equal to or greater than this value, the second threshold value is set to a value at which it can be determined that the heat load is large and the power consumption of the compressor or the like is relatively high. For example, the average seat surface temperature that the occupant feels comfortable is set to about 30 degrees, and the second threshold value is taken into consideration that the temperature inside the vehicle becomes 60 degrees or more when the vehicle is left in the scorching sun for a long time. Is set to a value in the range of 40 degrees to 60 degrees as an example. The target seat surface temperature is set in advance to an average temperature (for example, 30 degrees) that the occupant feels comfortable in consideration of the average body temperature of the occupant (about 36 degrees), but the occupant can set it. You may.

[0061]

545 Then, when the difference between the detected sheet surface temperature and the target sheet surface temperature is equal to or greater than the second threshold value, the process proceeds to step 108.

548 On the other hand, if the difference between the detected sheet surface temperature and the target sheet surface temperature is less than the second threshold value, the process proceeds to step 112.

[0062]

554 In step 108, the rotation speed of the compressor 12 is set to a predetermined rotation speed (first rotation speed) lower than the maximum rotation speed.

556 That is, in the next step 110 in which the cooling capacity is set to be lowered, the drive voltage of the blower fan 30 is set to a predetermined voltage lower than the maximum voltage. That is, the air volume of the blower fan 30 is set to an air volume smaller than the maximum air volume (first air volume).

[0063]

563 In step 116, the operation of the pre-air conditioning is started.

564 That is, the electric motor 70 is driven so that the compressor 12 rotates at the set rotation speed, and the blower motor 36 is driven so that the blower fan 30 is driven at the set air volume. At this time, the opening degree of the air mix damper 38 is set so that all the air after the evaporator is bypassed by the heater core 40, and the servomotor 42 is controlled accordingly.

[0064]

572 In step 118, the remaining capacity of the battery 71 detected by the SOC sensor 69 is taken in, and it is determined whether or not the remaining capacity is equal to or less than a predetermined predetermined amount.

575 The predetermined amount is set to a value at which, for example, if the remaining capacity of the battery 71 is equal to or greater than this value, the device operated by the electric power of the battery 71 can be operated normally.

[0065]

581 Then, when the remaining capacity of the battery 71 is not more than a predetermined amount, the process proceeds to step 120 to stop the operation of the pre-air conditioning.

583 That is, the drive of the compressor 12, the blower fan 30, and the like is stopped. On the

other hand, when the remaining capacity of the battery 71 exceeds the predetermined amount, the operation of the pre-air conditioning is continued until the remaining capacity of the battery 71 becomes the predetermined amount or less.

[0066]

590 As described above, in the present embodiment, heat is obtained when the difference between the detected vehicle interior temperature and the target vehicle interior temperature is large, and when the difference between the detected seat surface temperature and the target seat surface temperature is large. When the load is relatively high, the cooling capacity is reduced for pre-air conditioning, and when the heat load is relatively small, such as when at least one of the deviations is small, the cooling capacity is set to the maximum and pre-air conditioning is performed. ..

[0067]

600 Therefore, when the heat load is high, the decrease in power consumption becomes gradual as compared with the case where the compressor rotation speed and the air volume of the blower fan are maximized as in the conventional case, and the pre-air conditioning operation time, that is, the battery 71 The time until the remaining capacity becomes less than a predetermined amount can be lengthened.

605 Therefore, an appropriate cool-down performance can be obtained, and the heat capacity of the seat or the like on which the occupant sits can be effectively reduced.

607 Further, if the degree of decrease in the air volume of the blower fan 30 is increased, the degree of decrease in the rotation speed of the compressor can be reduced, and the temperature at which the air blown from the air outlet can be lowered can be lowered. .. Therefore, it is possible to increase the feeling of cold air when riding.

[0068]

614 If the heat load is small, the compressor rotation speed and blower fan air volume are maximized for operation, but the pre-air conditioning operation time is shortened (about 2 to 3 minutes) due to the maximum operation. The interior of the car will not be too cold.

[0069]

620 In the above, the case of performing pre-cooling has been described, but the present invention can also be applied to the case of performing pre-heating.

622 In this case, an electric heater 72 is provided, for example, as shown in FIG. 5, instead of the heater core 40 that heats the air passing by the cooling water heated by driving the engine.

624 In this case, the electric heater 72 has a configuration in which the heating capacity (electric power: wattage) can be changed, and is driven by the heater drive unit 74.

[0070]

629 In such a configuration, preheating can be performed by the same control as the flowchart shown in FIG. 4, and the electric heater 72 may be driven instead of the compressor 12.

631 That is, in step 104, it is determined whether or not the difference between the detected vehicle interior temperature and the target vehicle interior temperature (the value obtained by subtracting the detected vehicle interior temperature from the target vehicle interior temperature) is equal to or greater than the first threshold value. .. The first threshold value and the target vehicle interior temperature may be set to different values from those in the case of pre-cooling.

[0071]

640 Then, when the difference between the detected vehicle interior temperature and the target vehicle interior temperature is not equal to or more than the first threshold value, the heating capacity of the electric heater is set to the maximum in step 108.

[0072]

646 In step 106, it is determined whether or not the difference between the detected sheet surface temperature and the target sheet surface temperature (value obtained by subtracting the detected sheet surface temperature from the target sheet surface temperature) is equal to or greater than the second threshold value.

650 The second threshold value and the target sheet surface temperature may be set to different values from those in the case of pre-cooling.

[0073]

655 Then, when the difference between the detected sheet surface temperature and the target sheet surface temperature is equal to or greater than the second threshold value, the heating capacity of the electric heater 72 is set lower than the maximum capacity in step 108.

[0074]

661 Further, when starting the operation of the pre-air conditioning in step 116, the opening degree of the air mix damper 38 is set so that all the air after the evaporator passes through the electric heater 72, and the servomotor 42 is controlled accordingly.

[0075]

667 Not limited to the electric heater, other heaters such as a combustion type heater may be used

as long as the heater can have a variable heating capacity.

[0076]

672 Further, the vehicle air conditioner 10 according to the present embodiment has a configuration using an electric compressor, and is suitable for a hybrid vehicle or an electric vehicle in which a driving force is obtained by an engine and a motor, but an electric compressor is used. It can also be applied to vehicles that obtain driving force only by the engine if it is available.

[0077]

680 It is a figure which shows the schematic structure of the air conditioner for a vehicle which concerns on this invention.

682 It is a block diagram which shows the schematic structure of the control system of the air conditioner for a vehicle which concerns on this invention.

684 (A) is an external view of the remote control key, and (B) is a schematic block diagram of the remote control key.

686 It is a flowchart which shows the pre-air-conditioning control routine which is executed in the air-conditioning control part.

688 It is a block diagram which shows the schematic structure of the control system of the air-conditioning apparatus for vehicles which concerns on the modification of this invention.

690 Description of the sign

[0078]

694 10 Vehicle air conditioner 12 Compressor (adjusting means) 28 Air outlet 30 Blower fan (adjusting means) 34, 42, 46 Servo motor 36 Blower motor 38 Air mix damper 40 Heater core 50 Air conditioning control unit (control means) 54 Operation panel 56 Evaporator Rear temperature sensor 58 Outside air temperature sensor 60 Vehicle interior temperature sensor (vehicle interior temperature detection means) 62 Solar radiation sensor 64 Receiver 66 Memory 68 Seat surface temperature sensor (surface temperature detection means) 69 SOC sensor (detection means) 70 Electric motor 71 Battery (Storage means) 74 Heater drive unit 80 Remote control key

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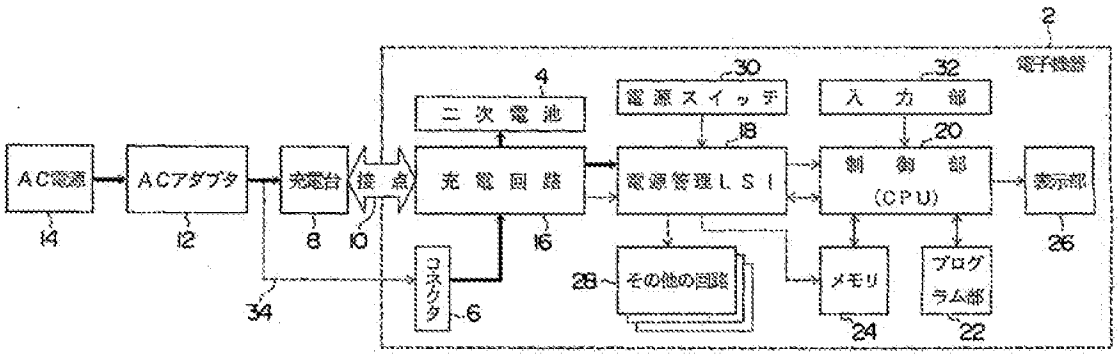

14...AC POWER SUPPLY
12...AC ADAPTER
8...CHARGING BASE
10...CONTACT
4...SECONDARY BATTERY
16...CHARGING CIRCUIT
6...CONNECTOR
30...POWER SWITCH
18...POWER SUPPLY MANAGEMENT LSI
28...OTHER CIRCUITS
32...INPUT SECTION
20...CONTROL SECTION (CPU)
24...MEMORY
22...PROGRAM SECTION
26...DISPLAY SECTION
2...ELECTRONIC APPARATUS

(57) Abstract: An electronic apparatus employing a secondary battery as a power supply in which a user can set conduction of the secondary battery under charge so that convenience of the electronic apparatus is enhanced. The electronic apparatus employing a secondary battery as a power supply comprises a section (charging circuit (16)) for detecting charging of the secondary battery, a section (power switch (30), memory (24)) for setting conduction state or conduction stop state of the secondary battery under charge, and a section (control section (20), power supply management LSI (18)) for controlling the secondary battery to conduction state or conduction stop state with reference to setting at the setting section.

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(57) 要約:　電源に二次電池を用いる電子機器に関し、二次電池の充電中の通電をユーザが設定可能にすることにより、電子機器の利便性を高める。電源に二次電池を用いた電子機器であって、二次電池の充電を検知する充電検知部（充電回路１６）と、二次電池を充電中に通電状態又は通電停止状態にする設定を行う設定部（電源スイッチ３０、メモリ２４）と、充電検知部の充電検知に基づき、設定部の前記設定の参照により、二次電池を通電状態又は通電停止状態に制御する制御部（制御部２０、電源管理ＬＳＩ１８）とを備えた構成である。

明　細　書

電子機器

技術分野

本発明は、電源に繰り返し充電が可能な二次電池を用いる携帯電話機、ＰＤＡ（Personal Digital Assistant）、ＰＨＳ（Personal Handyphone System）、ディジタルカメラ等の電子機器の給電制御に関し、特に、二次電池の充電中に通電させるか否かを人為的に設定可能にし、二次電池の充電時に通電状態又は通電停止状態を自動化した電子機器に関する。

背景技術

携帯電話機、ＰＤＡ、ＰＨＳ、ディジタルカメラ等の電子機器では、電源に二次電池を使用し、携帯中はその二次電池を使用し、自宅やオフィスではその二次電池の充電を行う。この場合、二次電池は外部電源に接続して充電し、その外部電源の接続に連動して電子機器の給電を停止状態にすることが行われる。しかし、携帯電話機やＰＤＡ等では、ＡＣアダプタを接続した状態で充電中にも使用する場合がある。

また、電子機器によっては自動電源オン機能が備えられている。予め設定された時刻になると自動的に携帯電話機の電源がオン状態に切り換えられる機能を備えたものがある。

携帯電話機等の電子機器の充電制御に関する先行特許文献には、例えば、特開２００２－２３２７５０号公報、特開２００１－２８１３７０号公報等がある。特開２００２－２３２７５０号公報には、ドッキングステーションに電子機器を設置し、二次電池の充電を可能にした電子機器システムにおいて、電子機器への外部電源の接続に連動して、その電子機器の電源をオフ状態にし、充電回路を作動させて二次電池への充電を行うことが開示されている。また、特開２００１－２８１３７０号公報には、使用者の都合のよい時間に電源を自動的にオフするように構成された電子機器が開示されている。

ところで、携帯電話機等の電子機器では、二次電池の充電期間を短くしたいという要求や、二次電池の充電中にも使用可能としたいという要求等、様々な要求がある。充電期間を短縮化するには、電源をオフ状態にして二次電池の使用を停止させることが必要であり、充電中、使用可能とすれば、その充電期間が延びることになる。通電状態は電力消費を伴い、通電を継続しながら、充電期間を短縮することは不可能なことである。

また、携帯電話機等の電子機器では、電源スイッチの操作が支配的であり、二次電池の充電と通電状態や通電停止状態との関係を変更することができない。二次電池の充電が完了し又は停止しても、電源スイッチがオフ状態では、電子機器は動作状態になることはない。このため、電源スイッチの投入を忘れると、使用不能となる等、使い勝手が悪いという問題がある。携帯電話機では、電源スイッチを投入し忘れると、着信することができない。

発明の開示

本発明は、上記課題を解決することを目的としたものであり、係る目的を詳しく言えば、電源に二次電池を用いる電子機器に関し、二次電池の充電中の通電をユーザが設定可能にすることにより、電子機器の利便性を高めることにある。

上記目的を達成するため、本発明は、電源に二次電池を用いた電子機器であって、前記二次電池の充電を検知する充電検知部と、前記二次電池を充電中に通電状態又は通電停止状態にする設定を行う設定部と、前記充電検知部の充電検知に基づき、前記設定部の前記設定の参照により、前記二次電池を前記通電状態又は前記通電停止状態に制御する制御部とを備えた構成としたものである。

係る構成とすれば、設定部に充電中の二次電池を通電状態か通電停止状態かが設定されると、充電検知部が二次電池の充電を検知したことにより、制御部は設定部の前記設定を参照し、二次電池を通電状態又は通電停止状態に制御する。従って、ユーザは、設定部の設定を選択することにより、例えば、充電開始を契機とし、充電中の二次電池を通電状態から通電停止状態を自動的に切り換えることが可能である。通電停止状態で二次電池を充電状態にすれば、その充電期間が短縮され、通電状態で二次電池を充電状態にすれば、その充電期間が延長されるが

、電子機器を動作状態にすることができる。

また、上記目的を達成するため、本発明は、電源に二次電池を用いた電子機器であって、前記二次電池と充電器との接続を検知する接続検知部と、この接続検知部の検知出力を受け、前記二次電池と前記充電器との接続解除により、前記二次電池を通電状態にする制御部とを備えた構成としたものである。

係る構成とすれば、二次電池から充電器の接続が解除されると、充電が停止されるので、この接続解除を検知して二次電池を通電状態とすることができ、この結果、電子機器は動作状態になり、使用可能となる。

また、上記目的を達成するためには、前記制御部は、前記二次電池の充電終了により、前記二次電池を通電状態にする構成としてもよい。ここで、「充電終了」とは、充電が完了した状態、充電が中途で解除された状態、充電レベルが所定レベルに到達して充電を解除した状態、充電器が外されて充電ができない状態等である。かかる構成とすれば、充電が終了したとき、二次電池が通電状態となり、電子機器を動作状態にすることができる。

また、上記目的を達成するためには、前記二次電池を充電中に通電状態又は通電停止状態にする設定を行う設定部を備え、前記制御部は、前記接続検知部の前記接続解除の検知に基づき、前記設定部の設定を参照し、前記二次電池を通電状態又は通電停止状態にする構成としてもよい。かかる構成により、接続解除時にユーザが希望する通電状態又は通電停止状態に移行させることが可能である。

また、上記目的を達成するためには、前記接続検知部は、前記二次電池が前記充電器に接続されているか否かを検知する構成としてもよい。

また、上記目的を達成するためには、前記接続検知部は、前記二次電池と前記充電器とが接続されているか否かを検知する第１の着脱検知部と、充電台に前記電子機器が設置されて前記二次電池に接続されているか否かを検知する第２の着脱検知部とを備えた構成としてもよい。

また、上記目的を達成するためには、前記設定部は、前記二次電池を充電中に通電状態又は通電停止状態にする設定を行うスイッチと、このスイッチにより設定される情報を格納する記憶部とを備える構成としてもよい。この場合、前記スイッチは、前記電子機器の電源スイッチに前記設定の機能を割り付けて構成して

もよい。

上記目的を達成するためには、前記制御部は、前記二次電池の充電中の通電状態において、前記二次電池からの前記電子機器の機能部中の給電対象又は給電停止対象を選択し、前記給電対象を給電状態、前記給電停止対象を給電停止状態にする構成としてもよい。このように、電子機器において、給電状態とする対象、給電停止状態とする対象を設定する構成とすれば、充電中、二次電池を通電状態に維持する場合、その負担の軽減が図られるとともに、充電期間中の機能選択の自由度が付与される。また、この場合、前記給電対象として少なくとも前記制御部、前記給電停止対象としてプロセッサ、メモリを含む構成としてもよい。

そして、本発明の他の目的、特徴及び利点は、添付図面及び各実施の形態を参照することにより、一層明瞭となるであろう。

図面の簡単な説明

図１は本発明に係る電子機器の充電形態の一例を示すブロック図である。

図２は本発明に係る電子機器の充電形態の他の例を示すブロック図である。

図３は第１の実施形態に係る電子機器の概要を示すブロック図である。

図４は第１の実施形態に係る電子機器の通電制御の一例を示すフローチャートである。

図５は第１の実施形態に係る電子機器の通電制御の一例を示すフローチャートである。

図６は第２の実施形態に係る電子機器の概要を示すブロック図である。

図７は第２の実施形態に係る電子機器の通電制御の一例を示すフローチャートである。

図８は第２の実施形態に係る電子機器の通電制御の一例を示すフローチャートである。

図９は第３の実施形態に係る電子機器の概要を示すブロック図である。

図１０は第４の実施形態に係る電子機器の概要を示すブロック図である。

図１１は第４の実施形態に係る電子機器の通電制御の一例を示すフローチャートである。

図１２は、第５の実施形態に係る携帯電話機の充電形態の一例を示す図である。

図１３は、第５の実施形態に係る携帯電話機の充電形態の他の例を示す図である。

発明を実施するための最良の形態

本発明の実施形態に係る電子機器について、図１及び図２を参照して説明する。図１は充電台経由で充電する充電形態、図２はＡＣアダプタに直結して充電する充電形態を示している。

電子機器２は、携帯電話機、ＰＤＡ、ＰＨＳ、ディジタルカメラ等の各種の機器であって、電源に二次電池４を内蔵したものである。ここで、二次電池４は、充電に適さない一次電池と異なり、充電により繰り返し使用できる電池であって、蓄電池と同義である。また、この電子機器２には、外部電源が接続可能なコネクタ６を備えている。

図１に示すように、充電台８には、電子機器２が設置されて、接点１０を介して電気的に接続される。この充電台８にはＡＣ／ＤＣ（Alternating Current/Direct Current）コンバータであるＡＣアダプタ１２が接続され、このＡＣアダプタ１２には交流電源１４が接続される。交流電源１４は例えば、１００ボルトや２００ボルトの商用交流電源が使用される。ＡＣアダプタ１２は、この交流電源１４を降圧した後、整流して電子機器２に対する給電や二次電池４の充電に適した直流電圧に変換する。この場合、電子機器２の二次電池４に対し、充電台８、ＡＣアダプタ１２及び交流電源１４が充電器を構成している。

このような充電形態では、交流電源１４にＡＣアダプタ１２が接続されている場合において、充電台８に電子機器２が設置されると、電子機器２の二次電池４に充電台８及び接点１０を通してＡＣアダプタ１２から充電電流が流れ、二次電池４の充電が行われる。

また、図２に示す充電形態では、ＡＣアダプタ１２が充電台８（図１）から外されて電子機器２のコネクタ６に直結されたものである。このような充電形態では、交流電源１４にＡＣアダプタ１２が接続されている場合において、電子機器

２の二次電池４にコネクタ６を介してＡＣアダプタ１２から充電電流が流れ、二次電池４の充電が行われる。この場合、電子機器２の二次電池４に対し、ＡＣアダプタ１２及び交流電源１４が充電器を構成している。

（第１の実施形態）

次に、本発明の第１の実施形態について、図３を参照して説明する。図３は、第１の実施形態に係る電子機器の概要を示している。

電子機器２は既述の充電形態によって二次電池４の充電が可能であり、二次電池４の充電は充電回路１６により行われるが、この実施形態では、この充電回路１６が二次電池４の充電を検知する充電検知部、充電台８と二次電池４との接続、二次電池４に対する充電器側の接続を検知する接続検知部を構成している。充電回路１６にはコネクタ６が接続されているとともに、電子機器２が充電台８に設置されたとき、接点１０を介してＡＣアダプタ１２が接続され、二次電池４の充電が行われる。この場合、充電検知部としての充電回路１６は、ＡＣアダプタ１２から二次電池４に電力の供給が開始されたこと（充電開始）を表す検知出力又は充電中を表す検知出力を発生する。

電源管理ＬＳＩ（Large Scale Integration ）１８は、充電回路１６から前記検知出力を受け、通電切換え等を行う電源管理部を構成しており、充電回路１６からの検知出力を受け、充電が開始されたこと、又は充電中を表す管理情報等を発生して制御部２０に通知するとともに、制御部２０からの制御出力を受け、電子機器２の機能部として制御部２０、プログラム部２２、メモリ２４、表示部２６、その他の回路２８等に対して二次電池４を通電状態とするか通電停止状態とするかの通電切換えを決定する。制御部２０は、ＣＰＵ（Central Processing Unit ）等で構成されており、電源管理ＬＳＩ１８からの管理情報を受け、メモリ２４が記憶している設定情報を読み出し、電源をオフするか否か、即ち、通電状態とするか通電停止状態とするかを表す制御出力を電源管理ＬＳＩ１８に付与する。また、プログラム部２２は、制御プログラムを格納する記録媒体として例えば、ＲＯＭ（Read-Only Memory）で構成され、制御部２０等に実行させる通電制御プログラム等の各種のソフトウェアを格納している。

メモリ２４は、既述の制御プログラムに付随する各種データを格納する記憶部

であって、ＲＡＭ（Random-Access Memory）、フラッシュメモリ等で構成され、電子機器２の動作や制御等に用いられる通常のデータの他に例えば、電源スイッチ３０に設定スイッチを割り付け、この電源スイッチ３０から入力される設定情報が格納されている。この設定情報は電源管理ＬＳＩ１８及び制御部２０を通してメモリ２４に格納され、その内容は、例えば、充電開始と同時に電源をオフするか否かを表す設定情報であり、具体的には、充電中の二次電池４を通電状態とするか、通電停止状態とするかの設定情報である。即ち、この場合、二次電池４を充電中に通電状態又は通電停止状態にする設定を行う設定部が例えば、電源スイッチ３０及びメモリ２４で構成されている。

この実施形態において、表示部２６は、例えば、液晶表示器等で構成され、制御部２０が発生する表示出力を受け、例えば、設定情報等が表示される。また、その他の回路２８には、携帯電話機であれば、通信機能部等、ＰＤＡであれば、情報処理部、ディジタルカメラであれば、カメラ機能部等が実装されている。

また、この実施形態において、制御部２０には入力部３２から制御入力が加えられるので、電源スイッチ３０に割り付けた設定スイッチとしての機能を入力部３２に割り付け、電源スイッチ３０又は入力部３２の何れか一方又は双方から既述の設定情報を設定するようにしてもよい。この入力部３２は、例えば、携帯電話機であれば、キースイッチ等で構成すればよい。この場合、二次電池４を充電中に通電状態又は通電停止状態にする設定を行う設定部は入力部３２及びメモリ２４で構成される。

そして、図３に示す充電形態では充電台８を用いているが、図２に示す充電形態を構成してもよく、例えば、図３に破線３４で示すように、ＡＣアダプタ１２の出力コネクタをコネクタ６に直結させて二次電池４を充電するように構成することも可能である。

次に、本発明の第１の実施形態に係る電子機器の通電制御を図４を参照して説明する。図４は、充電開始時に自動電源オン設定の処理の一例を示すフローチャートである。

この処理は、二次電池４の充電開始時に自動的に電源をオン状態（通電状態）にするか否かの設定処理である。この処理では、電子機器２を動作状態にして通

電を制御し、表示部２６に充電時に自動的に電源をオン状態とするか否か（通電状態とするか否か）を表す表示をさせる（ステップＳ１）。ここで、「自動的にオン状態とする」（＝自動オン）とは、二次電池４の充電を維持しながら、二次電池４からの電子機器２の制御部２０等の機能部への通電を維持することであり、「自動的にオフ状態とする」（＝自動オフ）とは、二次電池４の充電のみを選択し、二次電池４からの電子機器２の制御部２０等の機能部への通電を停止させることである。そこで、このガイド表示に従って、自動オンか（ＹＥＳ）か自動オフ（ＮＯ）かを選択する（ステップＳ２）。

この選択が完了すると、自動オン（ＹＥＳ）か自動オフ（ＮＯ）かが判定され（ステップＳ３）、自動オン（ＹＥＳ）が選択されている場合には、「真」が設定され（ステップＳ４）、充電開始時、自動電源オン設定が行われる（ステップＳ５）。この設定情報がメモリ２４に格納される。また、自動オフ（ＮＯ）が選択されている場合には、「偽」が設定され（ステップＳ６）、充電開始時、自動電源オフ設定が行われる（ステップＳ５）。この設定情報がメモリ２４に格納される。この充電開始時の自動電源オン又はオフ設定を完了する。

この設定処理において、自動オン（ＹＥＳ）か自動オフ（ＮＯ）かの何れの選択も行われない場合には、初期設定として自動オン（ＹＥＳ）又は自動オフ（ＮＯ）の何れかを予め設定しておくことも可能である。

このような設定処理が行われた電子機器２について、二次電池４の充電は、図１に示すように、充電台６に電子機器２を設置し、又は図２に示すように、ＡＣアダプタ１２に電子機器２のコネクタ６を直結して充電を行う。

次に、この通電制御の充電開始時の処理について、図５を参照して説明する。図５は、充電開始時の処理の一例を示すフローチャートである。

充電が開始されると（ステップＳ１１）、充電開始時、自動電源オン設定が真（ＹＥＳ）か偽（ＮＯ）かが判定され（ステップＳ１２）、自動電源オンの設定が行われている場合（真）には、電源をオン状態にし（ステップＳ１３）、自動電源オフの設定が行われている場合（偽）には、電源をオフ状態にし（ステップＳ１４）、二次電池４の充電が継続される（ステップＳ１５）。

以上説明したように、この第１の実施形態の電子機器２では、二次電池４の充

電中に二次電池４から電子機器２の機能部への通電維持か通電停止かを設定し、その設定情報により、充電開始時に通電維持又は通電停止が自動的に選択される。充電中、通電維持により、電子機器２の機能部を動作状態ないし活性状態とし、通電停止により、二次電池４の充電が迅速化され、充電期間の短縮が図られる。充電中、動作状態とすれば、携帯電話機では電話や電子メールの着信が可能となるので、便利である。

（第２の実施形態）

次に、本発明の第２の実施形態について、図６を参照して説明する。図６は、第２の実施形態に係る電子機器の概要を示している。

この電子機器２では、充電検知部としての充電回路１６に、充電台着脱検知部３６、ＡＣアダプタ着脱検知部３８、充電満了検知部４０が設置され、これら検知部３６、３８、４０の検知出力に応じた通電制御を実現している。その他の構成は、第１の実施形態と同様である。

充電台着脱検知部３６は、充電台８に電子機器２が設置されたか、充電台８から電子機器２が外されたかを検知する検知部であり、具体的には、その着脱によって生じる物理的現象を検知すればよく、その物理的現象は、例えば、充電電流が流れているか否か（充電電流の有無）、電子機器２と充電台８との着脱に応じて開閉される機械的なスイッチ又は光学的スイッチの開閉状態等で検出可能である。

また、ＡＣアダプタ着脱検知部３８は、コネクタ６にＡＣアダプタ１２が接続されたか、それが外されたかを検知する検知部であり、具体的には、その着脱によって生じる物理的現象を検知すればよく、その物理的現象は、例えば、充電電流が流れているか否か（充電電流の有無）、コネクタ６の着脱に応じて開閉される機械的なスイッチ又は光学的スイッチの開閉状態等で検出可能である。

また、充電満了検知部４０は、二次電池４が充電満了レベルに到達しているか否かを検知する検知部であり、具体的には、その充電レベルに応じて生じている物理的現象を検知すればよく、その物理的現象は、例えば、充電電流のレベルや電圧レベル等で検出可能である。

この電子機器２の通電制御について、図７を参照して説明する。図７は、充電

中の電子機器２が充電台８から外された場合、又はコネクタ６からＡＣアダプタ１２が外された場合の通電処理の一例を示すフローチャートである。

充電中の電子機器２が充電台８から外され、又はコネクタ６からＡＣアダプタ１２が外されると（ステップＳ２１）、その取外しを充電台着脱検知部３６又はＡＣアダプタ着脱検知部３８が検知し（ステップＳ２２）、その検知出力が電源管理ＬＳＩ１８を通じて制御部２０に通知され、電源をオン状態に移行させる（ステップＳ２３）。

このような処理によれば、充電中の電子機器２が充電台８から外され、又はコネクタ６からＡＣアダプタ１２が外されると、充電が解除されるので、その充電解除を契機として二次電池４を通電状態にし、電子機器２を動作状態又は活性状態に移行させることができる。この場合、充電が解除されたにも拘わらず、電源スイッチ３０を投入しなければ、動作状態又は活性状態に移行させることができない、という不都合を回避でき、電子機器２の利便性が高められる。

また、この電子機器２に対する通電制御について、図８を参照して説明する。図８は、充電中の電子機器２の二次電池４が満充電に到達した場合の通電処理の一例を示すフローチャートである。

充電を開始し（スイッチ３１）、充電中の電子機器２の二次電池４が満充電に到達したか否かを判定し（ステップＳ３２）、二次電池４が満充電に到達したとき、その判定出力が電源管理ＬＳＩ１８を通じて制御部２０に通知され、制御部２０からの指示により、充電を終了させる（ステップＳ３３）とともに、電源をオン状態に移行させる（ステップＳ３４）。即ち、このような通電状態への切換えは、電子機器２が充電台８に設置されている状態、又は電子機器２にＡＣアダプタ１２が接続された状態で行われる。

このような処理によれば、電子機器２の二次電池４の充電が完了したとき、その充電が解除されるとともに、その充電解除を契機として二次電池４を通電状態にし、電子機器２を動作状態又は活性状態に移行させることができる。この場合、充電が完了したにも拘わらず、電源スイッチ３０を投入しなければ、動作状態又は活性状態に移行させることができない、という不都合を回避でき、電子機器２の利便性を高めることができる。

（第３の実施形態）

次に、本発明の第３の実施形態について、図９を参照して説明する。図９は、第３の実施形態に係る電子機器の概要を示している。

この電子機器２では、給電対象を選定可能に構成されている。例えば、電源管理ＬＳＩ１８には、充電開始や充電解除等に対応した通電制御を可能にするため、常時、二次電池４が通電される。そこで、充電中以外の場合には、電源スイッチ３０がオフ状態にあるとき、電源管理ＬＳＩ１８は、制御部２０、プログラム部２２、メモリ２４、表示部２６、その他の回路２８等の機能部への通電を停止し、また、電源スイッチ３０がオン状態にあるとき、制御部２０、プログラム部２２、メモリ２４、表示部２６、その他の回路２８等、各機能部に通電をする。即ち、二次電池４の充電開始に伴う通電制御については、常時、電源管理ＬＳＩ１８に二次電池４から通電され、電源スイッチ３０がオンしなければ、その他の機能部への通電が停止される。また、二次電池４の通電による給電箇所の特定は、入力部３２からの選択入力によって設定することも可能である。

このような構成によれば、機能部に対する二次電池４による通電を特定し、その選択により、充電中の通電制御を可能にするとともに、充電時間の短縮を図ることが可能である。

（第４の実施形態）

次に、本発明の第４の実施形態について、図１０を参照して説明する。図１０は、本発明の第４の実施形態に係る電子機器の概要を示している。

この電子機器２では、充電検知部としての充電回路１６に、第２の実施形態の充電満了検知部４０に代え、充電レベル検知部４２が設置され、この充電レベル検知部４２の検知出力に応じた通電制御を実現している。その他の構成は、第２の実施形態と同様である。

充電レベル検知部４２は、二次電池４の充電レベルが予め設定された所定レベルに到達しているか否かを検知する検知部である。このレベル設定は、入力部３２を通じて設定情報としてメモリ２４に格納される。

次に、この電子機器２の通電制御を図１１を参照して説明する。図１１は、充電レベルに応じた通電処理の一例を示すフローチャートである。

充電が開始され（ステップＳ４１）、充電回路１６の充電レベル検知部４２が二次電池４の充電レベルが所定レベルに到達したか否かを常時監視し（ステップＳ４２）、その検知出力が電源管理ＬＳＩ１８を通じて制御部２０に通知される。その充電レベルが設定情報である所定レベルに到達すると、これを充電レベル検知部４２が検知し、その検知出力が電源管理ＬＳＩ１８を通じて制御部２０に通知され、その結果、充電終了とし（ステップＳ４３）、電源をオン状態に移行させる（ステップＳ４４）。

このような処理によれば、ユーザが二次電池４の満充電の到達を希望しない場合等、所望の充電レベルを設定し、これを設定情報として充電を終了させ、この充電終了を契機として二次電池４を通電状態にし、電子機器２を動作状態又は活性状態に移行させることができる。このような処理によっても、充電が解除されたにも拘わらず、電源スイッチ３０を投入しなければ、動作状態又は活性状態に移行させることができない、という不都合を回避でき、電子機器２の利便性を高めることができる。

（第５の実施形態）

次に、本発明の第５の実施形態について、図１２及び図１３を参照して説明する。図１２及び図１３は第５の実施形態に係る電子機器の充電形態の概要を示し、図１２は充電台を使用した場合、図１３はＡＣアダプタのみを使用した場合を示している。

この実施形態の電子機器２は携帯電話機４４であって、この携帯電話機４４が充電台８に設置され、充電台８にはＡＣアダプタ１２がケーブル４６及びコネクタ４８を通じて接続されている。ＡＣアダプタ１２には給電プラグ５０が設けられており、この給電プラグ５０は図示しない商用電源コンセントに接続され、携帯電話機４４に内蔵されている二次電池４を充電することができる。

また、携帯電話機４４のコネクタ６（図３、図６、図１０）にＡＣアダプタ１２のコネクタ４８を直結させ、このＡＣアダプタ１２の給電プラグ５０を図示しない商用電源コンセントに接続すれば、携帯電話機４４内の二次電池４を同様に充電させることができる。

そして、携帯電話機４４は、電子機器２として既述したように、図３、図６又

は図１０に示す各実施形態に示した構成とすることができ、図４、図５、図７、図８又は図１１に例示した通電制御を実行することができる。

この場合、図１０に示す実施形態において、充電台着脱検知部３６又はＡＣアダプタ着脱検知部３８は、例えば、充電電流や充電電圧でその着脱を検知する構成とすれば、図１２又は図１３に示すように、給電プラグ５０が電源コンセントから外された場合にも、その着脱検知と同様の処理で、通電を開始させることができる。従って、充電台８への設置やコネクタ６の接続が正常であっても、給電プラグ５０が外れている場合又は外された場合にも、電源スイッチ３０を投入しなければ動作状態又は活性状態に移行させることができない、という不都合を回避でき、電子機器２の利便性を高めることができる。

既述の実施形態について、変形例を以下に列挙する。

(1) 上記実施形態では、電源スイッチ３０の設定情報や入力部３２の設定情報をメモリ２４に格納し、メモリ２４から設定情報を参照する形態としたが、例えば、電源スイッチ３０や入力部３２に直接設定されている設定情報、例えば、スライドスイッチの設定位置等を設定情報として参照する形態としてもよい。

(2) 第４の実施形態（図１０）では、充電レベルの検出により充電終了としているが、例えば、充電レベルが所定レベルに移行するであろう時間を設定情報とし、充電開始から所定時間の経過で充電を解除し、通電開始とする制御を用いてもよい。

(3) 実施形態では、充電台８を用いる場合には、二次電池４の充電器として充電器８、ＡＣアダプタ１２及び交流電源１４を充電器とし、ＡＣアダプタ１２を電子機器２に直結する場合には、二次電池４の充電器としてＡＣアダプタ１２及び交流電源１４を充電器として説明したが、充電器としては、交流電源１４に代えて電池や直流電源を充電器として構成してもよい。

また、以上述べたように、本発明の最も好ましい実施形態等について説明したが、本発明は、上記記載に限定されるものではなく、請求の範囲に記載され、又は発明を実施するための最良の形態に開示された発明の要旨に基づき、当業者において様々な変形や変更が可能であることは勿論であり、係る変形や変更が、本発明の範囲に含まれることは言うまでもない。

産業上の利用可能性

本発明の電子機器は、充電中の二次電池を通電状態にするか又は通電停止状態にするかを設定する設定部を備え、制御部は、充電検知部が充電開始を検知したとき、二次電池の充電開始を設定部の設定を参照して二次電池を通電状態又は通電停止状態にする構成とすれば、通電停止状態で、充電期間を短縮するか、充電期間を犠牲にして電子機器を動作状態にするかをユーザが選択でき、電子機器の利便性を高めることができ、有用である。

また、本発明の電子機器は、二次電池と充電器との接続解除を検知したことにより、二次電池を通電状態にする制御部を備えた構成とすれば、接続解除を契機として二次電池を通電状態にし、電子機器を動作状態にすることができ、利便性が高められる。

また、本発明の電子機器は、電子機器の機能部中の給電対象又は給電停止対象を選択可能にし、選択された給電対象に給電し、又は選択された給電停止対象を給電停止とする構成とすれば、充電中、二次電池を通電状態に維持する場合、その負担を軽減でき、充電期間中の機能選択の自由度を高めることができる。

請 求 の 範 囲

1．電源に二次電池を用いた電子機器であって、

前記二次電池の充電を検知する充電検知部と、

前記二次電池を充電中に通電状態又は通電停止状態にする設定を行う設定部と、

前記充電検知部の充電検知に基づき、前記設定部の前記設定の参照により、前記二次電池を前記通電状態又は前記通電停止状態に制御する制御部と、

を備えた構成とした電子機器。

2．電源に二次電池を用いた電子機器であって、

前記二次電池と充電器との接続を検知する接続検知部と、

この接続検知部の検知出力を受け、前記二次電池と前記充電器との接続解除により、前記二次電池を通電状態にする制御部と、

を備えた構成とした電子機器。

3．前記制御部は、前記二次電池の充電終了により、前記二次電池を通電状態にする構成とした請求の範囲1記載の電子機器。

4．前記二次電池を充電中に通電状態又は通電停止状態にする設定を行う設定部を備え、前記制御部は、前記接続検知部の前記接続解除の検知に基づき、前記設定部の設定を参照し、前記二次電池を通電状態又は通電停止状態にする構成とした請求の範囲2記載の電子機器。

5．前記接続検知部は、前記二次電池が前記充電器に接続されているか否かを検知する構成とした請求の範囲2記載の電子機器。

6．前記接続検知部は、前記二次電池と前記充電器とが接続されているか否かを検知する第1の着脱検知部と、

充電台に前記電子機器が設置されて前記二次電池に接続されているか否かを検知する第２の着脱検知部と、

を備えた構成とした請求の範囲２記載の電子機器。

７．前記設定部は、前記二次電池を充電中に通電状態又は通電停止状態にする設定を行うスイッチと、

このスイッチにより設定される情報を格納する記憶部と、

を備える構成とした請求の範囲１又は４記載の電子機器。

８．前記スイッチは、前記電子機器の電源スイッチに前記設定の機能を割り付けて構成した請求の範囲７記載の電子機器。

９．前記制御部は、前記二次電池の充電中の通電状態において、前記二次電池からの前記電子機器の機能部中の給電対象又は給電停止対象を選択し、前記給電対象に給電し、前記給電停止対象を給電停止とする構成とした請求の範囲１又は２記載の電子機器。

１０．前記給電対象として少なくとも前記制御部、前記給電停止対象としてプロセッサ、メモリを含む構成とした請求の範囲９記載の電子機器。

図 1

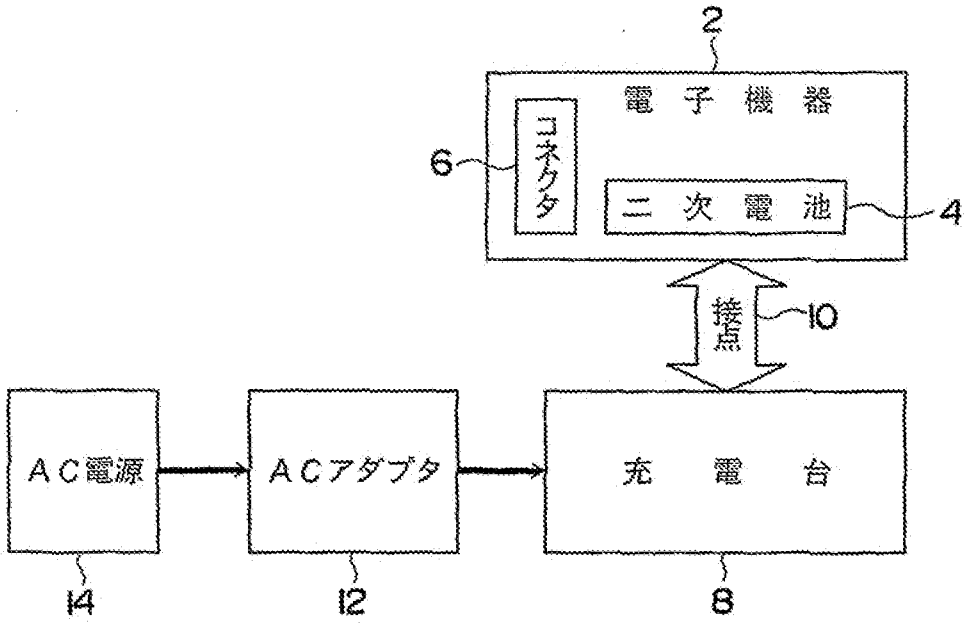


図 2

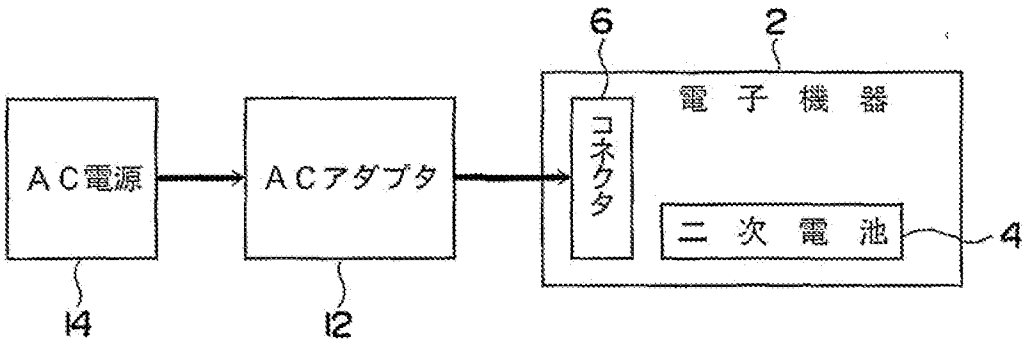


図 3

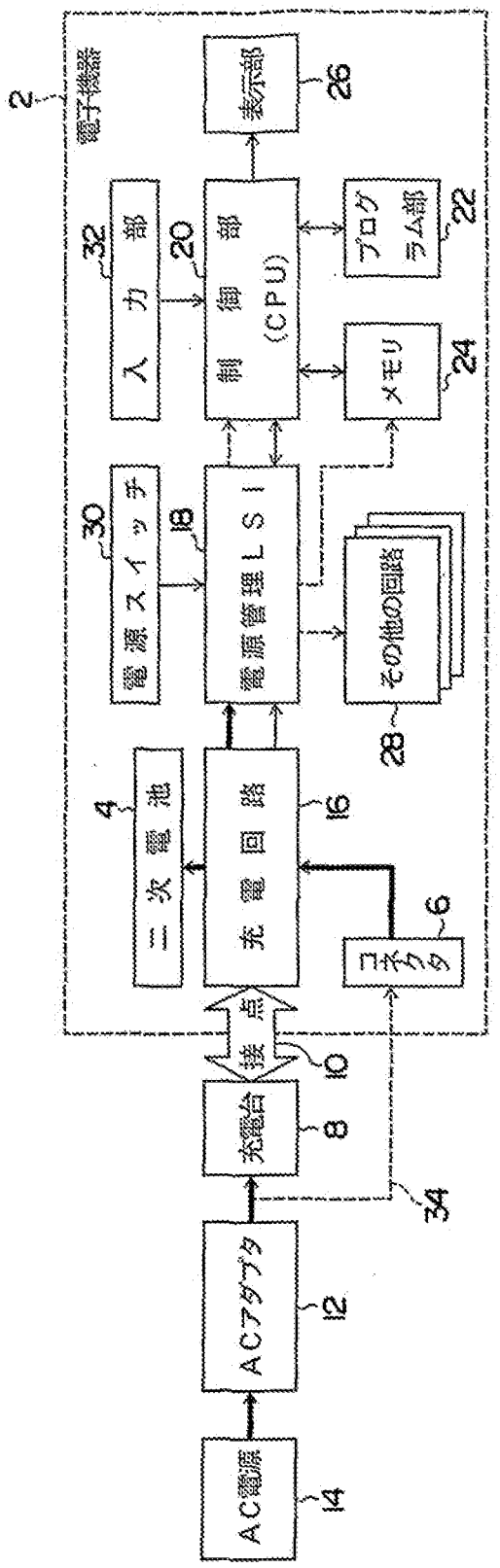


図 4

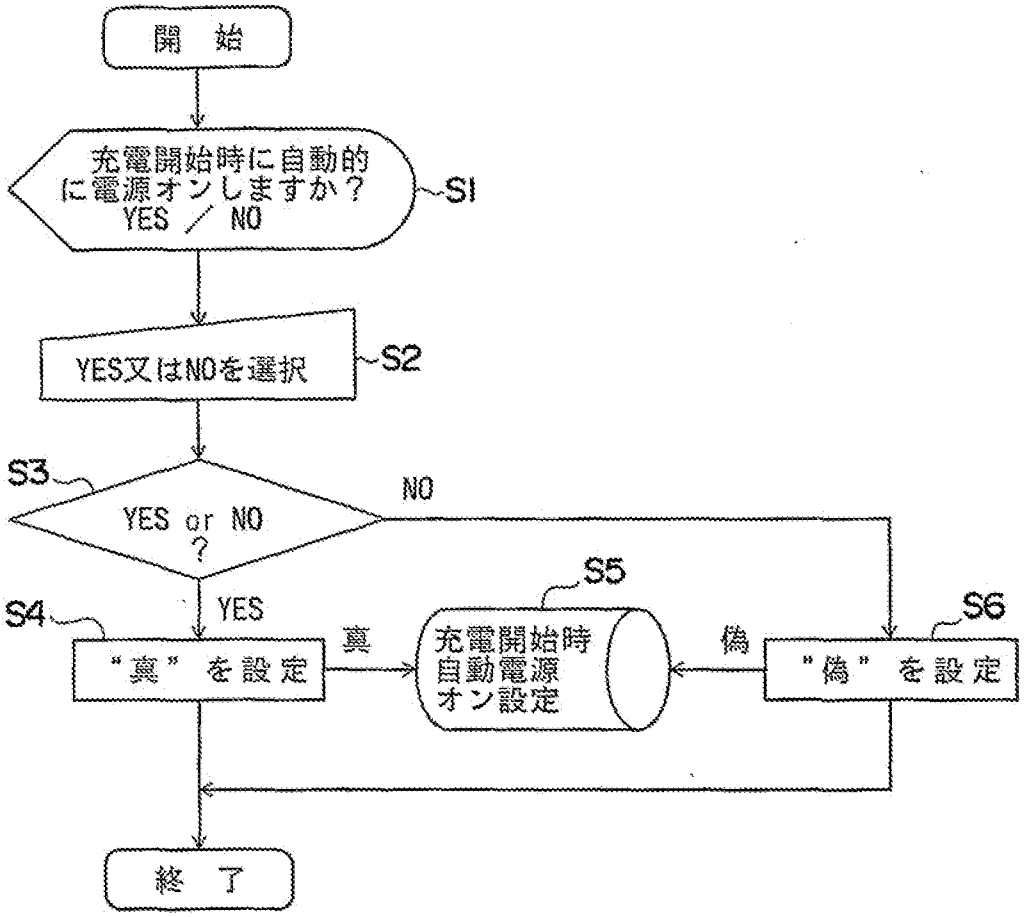
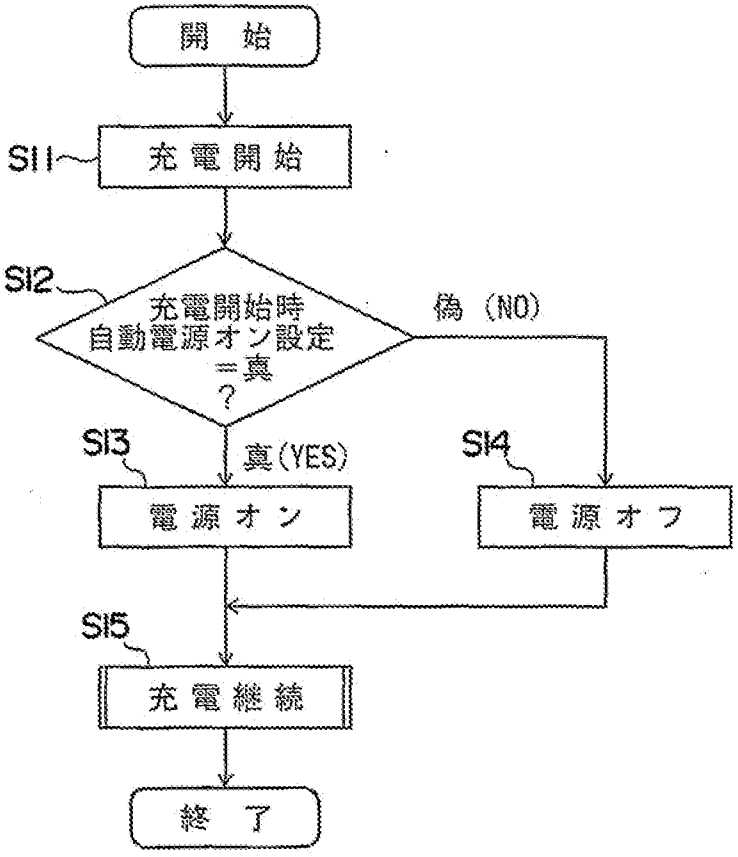


図 5



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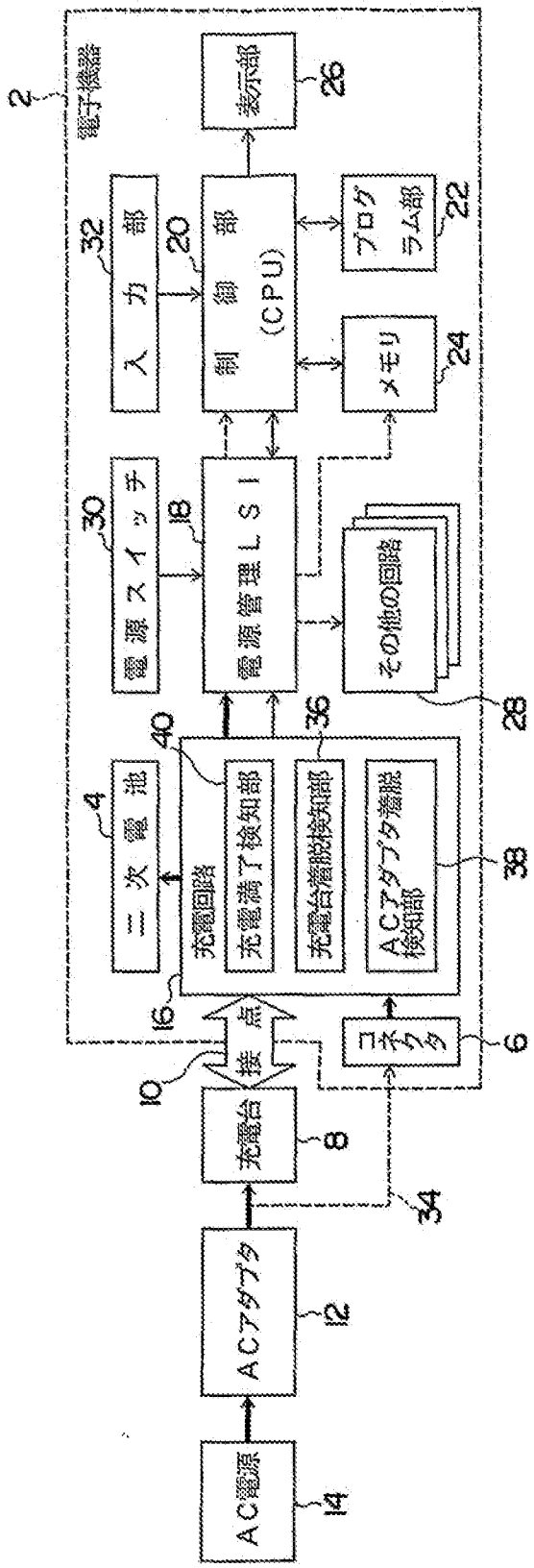


図 7

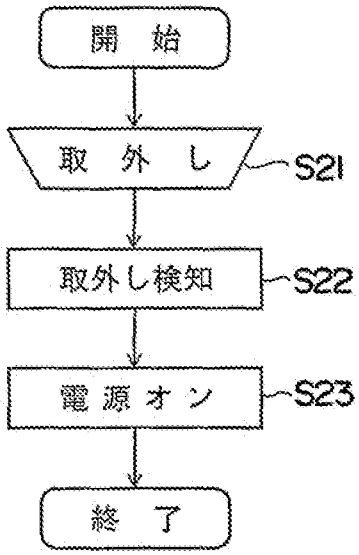


図 8

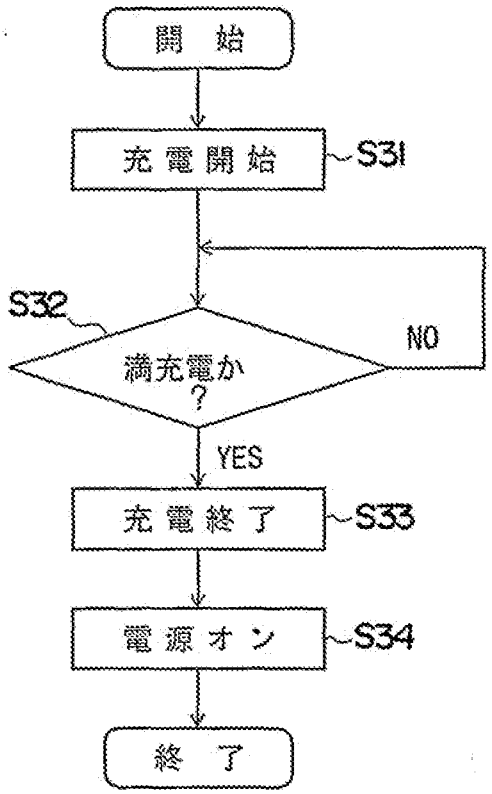


図 9

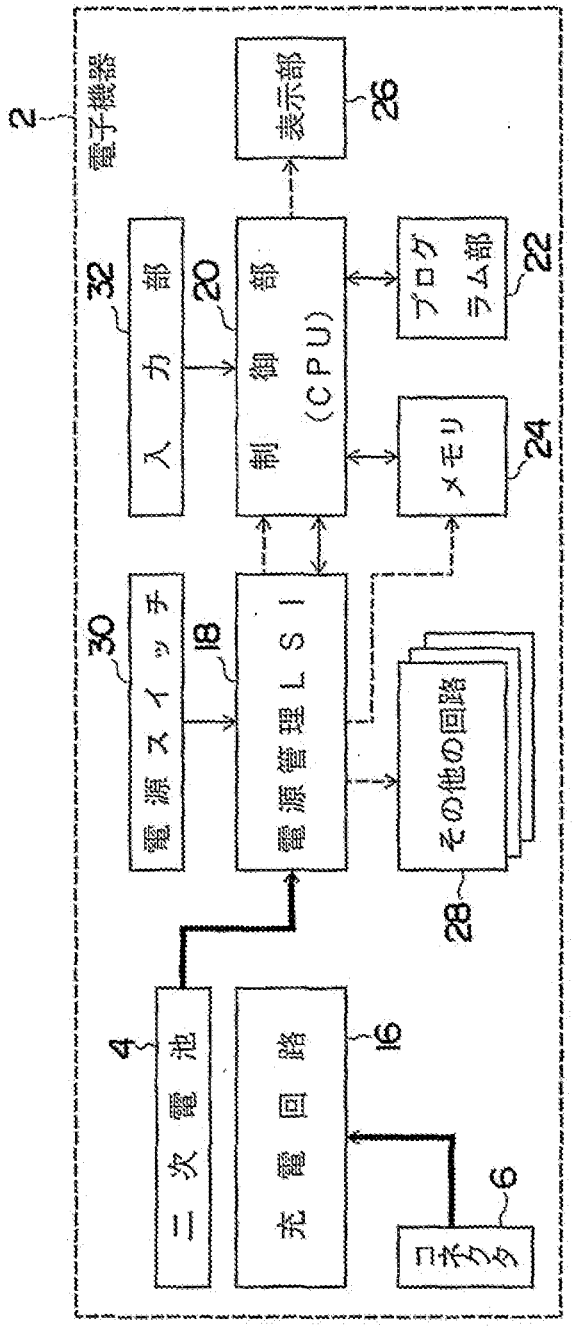


図10

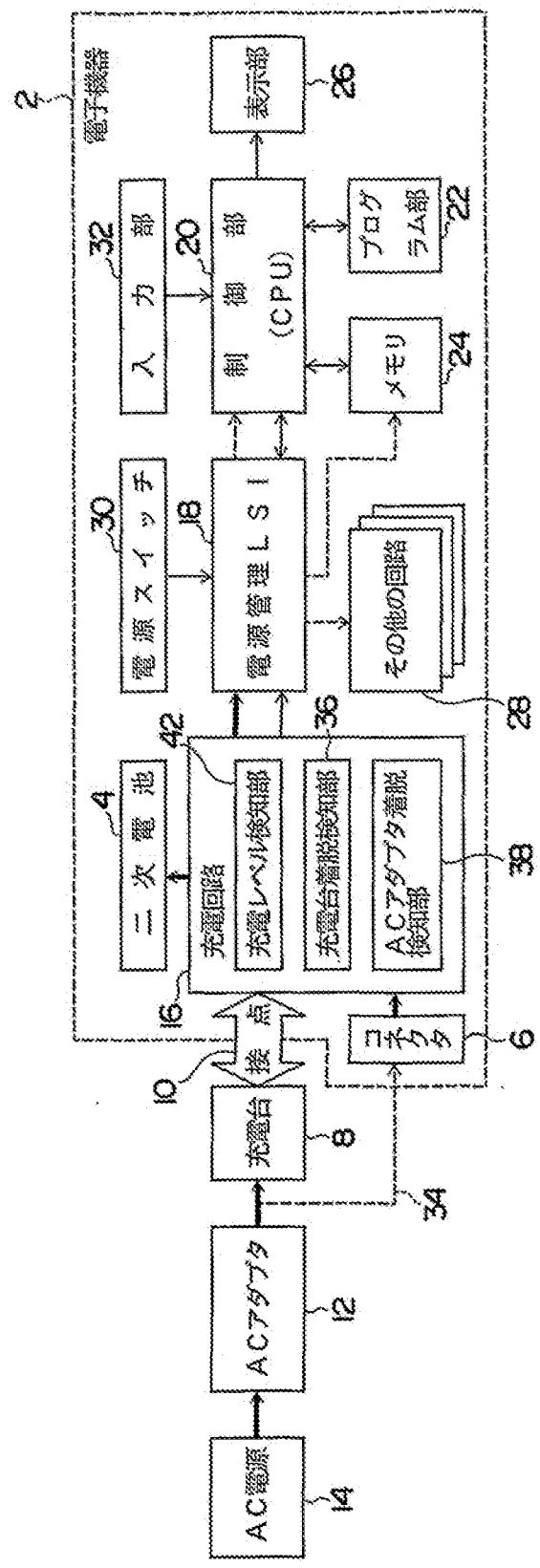


図11

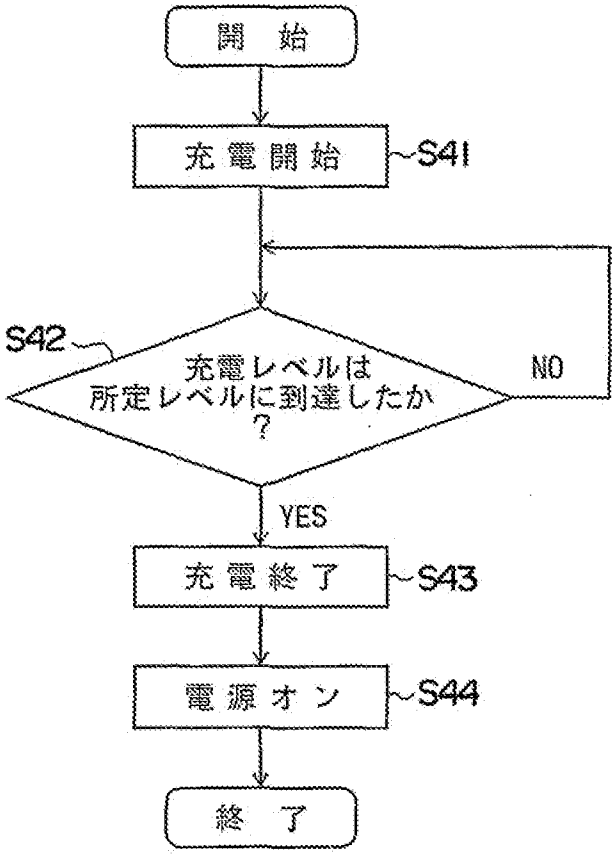


図12

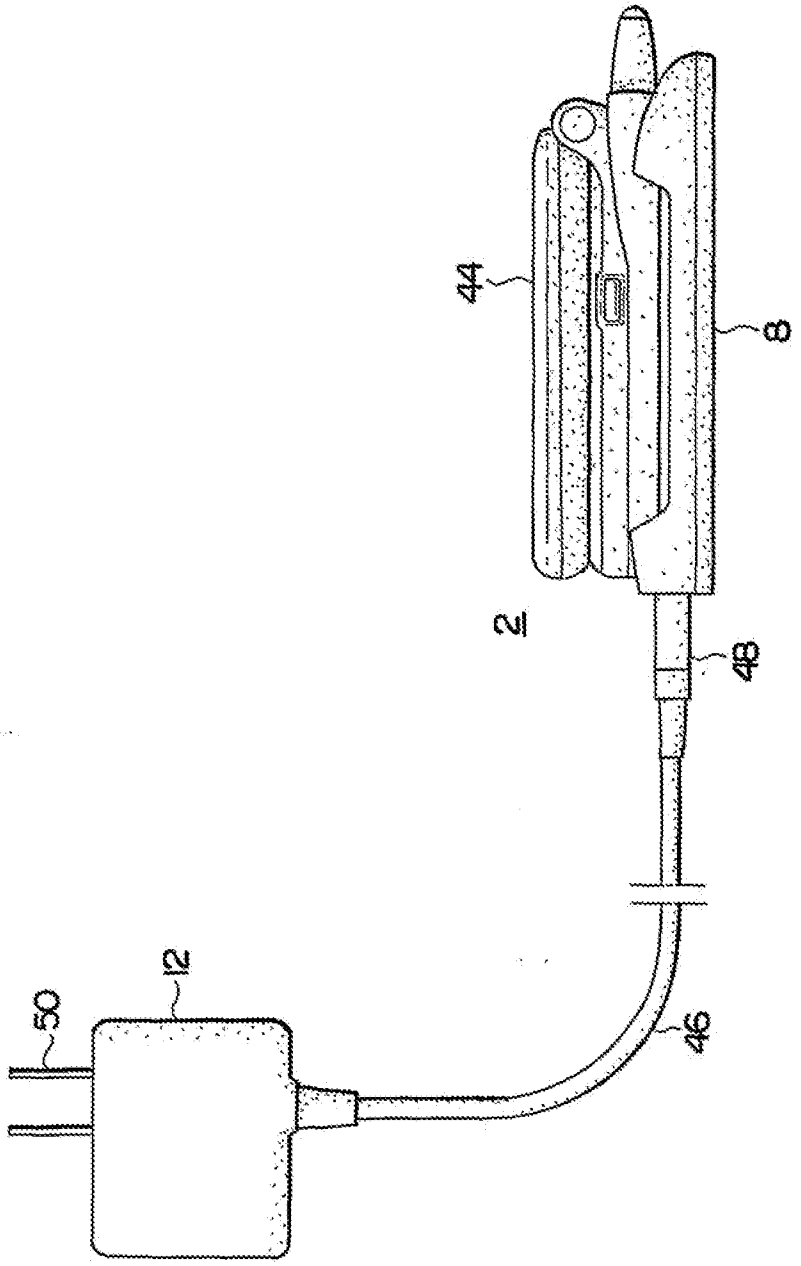
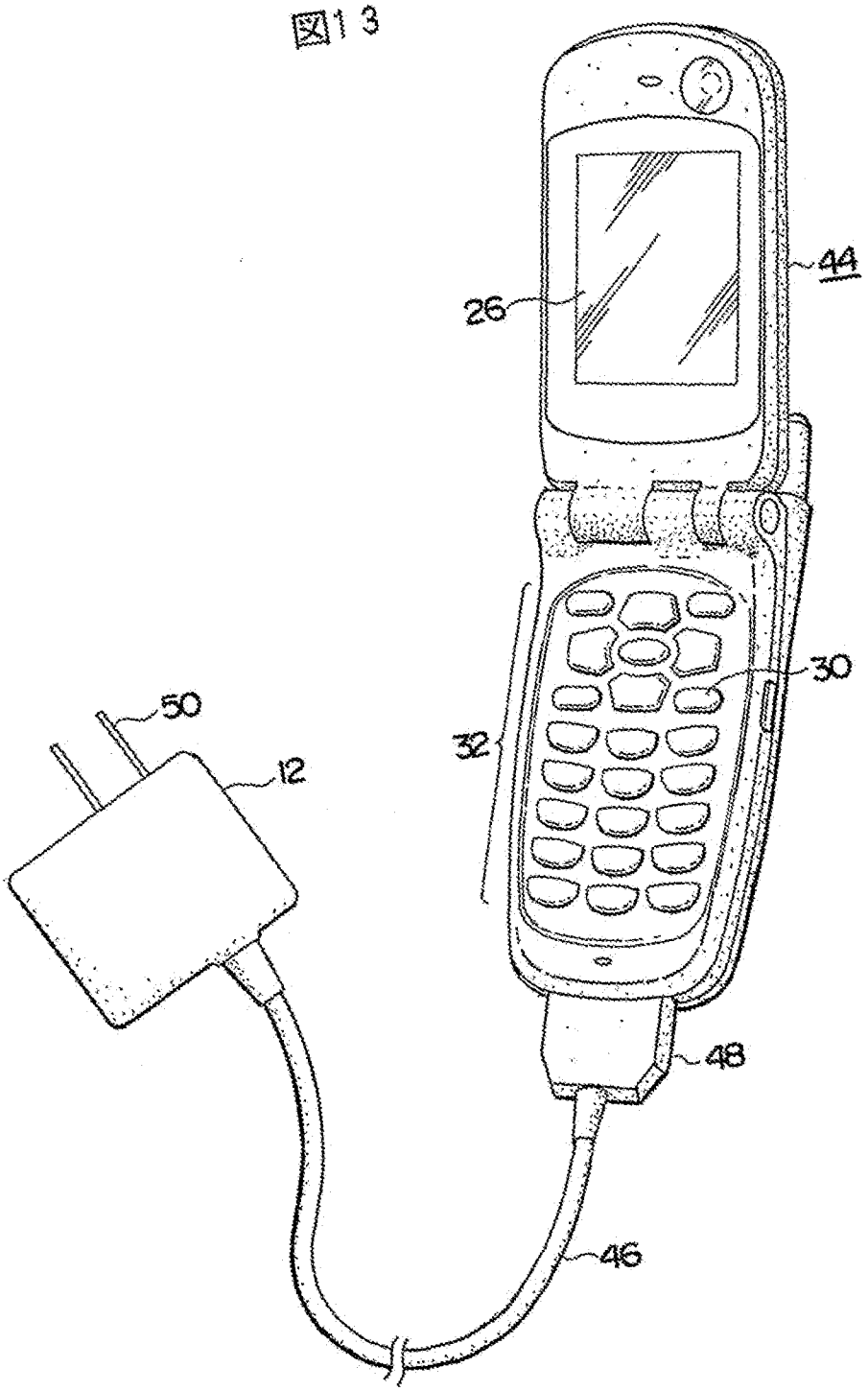


図13



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/07099

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] H02J7/04, G06F1/28, H04B7/26, H04M1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] H02J7/04, G06F1/28, H04B7/26, H04M1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Toroku Jitsuyo Shinan Koho	1994-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Jitsuyo Shinan Toroku Koho	1996-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 11-313134 A (Matsushita Electric Industrial Co., Ltd.), 09 November, 1999 (09.11.99), Par. Nos. [0028] to [0035]; Fig. 2 (Family: none)	1-5,7,8 6,9,10
Y	JP 2002-247775 A (Mitsubishi Electric Corp.), 30 August, 2002 (30.08.02), Par. No. [0004]; Fig. 9 (Family: none)	6
Y	JP 09-130325 A (Matsushita Electric Industrial Co., Ltd.), 16 May, 1997 (16.05.97), Claims (Family: none)	9,10

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search 03 July, 2003 (03.07.03)	Date of mailing of the international search report 15 July, 2003 (15.07.03)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/07099

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2002-084362 A (NEC Saitama, Ltd.), 22 March, 2002 (22.03.02), Claims (Family: none)	9
X	JP 2002-374325 A (Sanyo Electric Co., Ltd.), 26 December, 2002 (26.12.02), Full text; Figs. 1 to 7 (Family: none)	2,4,5,7,8
X	JP 05-327579 A (Matsushita Electric Industrial Co., Ltd.), 10 December, 1993 (10.12.93), Par. Nos. [0013] to [0015]; Figs. 1 to 7 (Family: none)	2,5

国際調査報告

国際出願番号 PCT/JP03/07099

A. 発明の属する分野の分類（国際特許分類（IPC））

Int. Cl' H02J7/04, G06F1/28, H04B7/26, H04M1/00

B. 調査を行った分野

調査を行った最小限資料（国際特許分類（IPC））

Int. Cl' H02J7/04, G06F1/28, H04B7/26, H04M1/00

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	1922－1996年
日本国公開実用新案公報	1971－2003年
日本国登録実用新案公報	1994－2003年
日本国実用新案登録公報	1996－2003年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

C. 関連すると認められる文献

引用文献のカテゴリー＊	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
X Y	JP 11－313134 A（松下電器産業株式会社） 1999.11.09, 【0028】～【0035】欄, 【図2】 （ファミリーなし）	1－5, 7, 8 6, 9, 10
Y	JP 2002－247775 A（三菱電機株式会社） 2002.08.30, 【0004】欄, 【図9】 （ファミリーなし）	6

☒ C欄の続きにも文献が列挙されている。　☐ パテントファミリーに関する別紙を参照。

＊ 引用文献のカテゴリー
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「&」同一パテントファミリー文献

国際調査を完了した日 03.07.03	国際調査報告の発送日 15.07.03
国際調査機関の名称及びあて先 日本国特許庁（ISA/JP） 郵便番号100－8915 東京都千代田区霞が関三丁目4番3号	特許庁審査官（権限のある職員） 嶋野 邦彦 印 5T 3053 電話番号 03－3581－1101 内線 6822

様式PCT/ISA/210（第2ページ）（1998年7月）

C（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
Y	JP　09－130325　A（松下電器産業株式会社） 1997．05．16，【特許請求の範囲】欄 （ファミリーなし）	9，10
Y	JP　2002－084362　A（埼玉日本電気株式会社） 2002．03．22，【特許請求の範囲】欄 （ファミリーなし）	9
X	JP　2002－374325　A（三洋電機株式会社） 2002．12．26，全文，【図1】～【図7】 （ファミリーなし）	2，4，5，7，8
X	JP　05－327579　A（松下電器産業株式会社） 1993．12．10，【0013】～【0015】欄，【図1】～【図7】（ファミリーなし）	2，5

Notice

DESCRIPTION JP2006112932A

10 Electric vehicle navigation system

[0001]

14 The present invention relates to an electric vehicle navigation system, and more particularly to an electric vehicle navigation system capable of displaying an arrival time at a destination in consideration of a charging time in a charging facility.

[0002]

20 In recent years, low-emission vehicles have become widespread in order to prevent global environmental destruction, especially global warming, and to preserve the global environment. Above all, the development of electric vehicles that do not emit exhaust gas at all has been enthusiastically promoted. ing.

[0003]

27 Electric vehicles depend on the capacity of the on-board battery installed, but especially when driving for a relatively long distance, the on-board battery can be charged on the way to the starting point, destination, or destination. May be needed.

30 However, at present, charging equipment is not always sufficiently widespread.

[0004]

34 Therefore, a navigation device (see Patent Document 1) that reads information from a storage medium such as a DVD-ROM that stores the position information of the charging equipment and superimposes the information on the charging equipment on a map displayed on the display panel, and an object thereof. A navigation system (see Patent Document 2) that

searches for and displays charging equipment in or near the destination so that the next run can be performed even after reaching the destination, and is necessary to reach the destination. A navigation system (see Patent Document 3) that calculates and announces the charging time of electric power to an in-vehicle battery has been proposed.

42 特開２００１－２１５１２４号公報

43 特開２００３－２９４４６３号公報

44 特開２００１－１１２１２１号公報

[0005]

48 However, at present, it takes tens of minutes to several hours to charge an in-vehicle battery of an electric vehicle.

50 Therefore, from the driver's point of view, it is important to know where the charging equipment is, but it is also important to know how long it takes to charge the charging equipment and, after all, when and when the destination can be reached. be.

53 That is, the navigation system is required to predict the total time including the charging time from the current position of the electric vehicle to the destination and notify the driver of the total time prediction.

[0006]

59 On the other hand, for the driver, for example, if it is necessary to charge the in-vehicle battery on the way to the destination and it takes time to charge, the driver can use the time to eat or charge the charging equipment. You will want to visit tourist spots near.

62 The navigation system is convenient if it can provide a dining place or a tourist spot near the charging facility in order to meet the needs of such a driver or the like.

[0007]

67 Therefore, an object of the present invention is to provide a navigation system for an electric vehicle capable of predicting a total time to a destination including a charging time of an in-vehicle battery.

70 Another object of the present invention is to provide a navigation system for an electric vehicle capable of providing information on a dining place, a tourist spot, a leisure facility, etc. around a charging facility.

[0008]

76 In order to solve the above-mentioned problem, the navigation system of the electric vehicle according to claim 1 aligns the current position of the own vehicle with the map information and provides the driver with electricity to guide the route to the destination. In an automobile navigation system, a display unit for displaying the route, an input unit for inputting the

destination, a battery management unit for measuring the remaining capacity of an in-vehicle battery, position information of charging equipment, information on charging performance, and the above. A database unit in which map information is stored, the remaining capacity of the in-vehicle battery, the fuel efficiency of the electric vehicle, the distance from the current position of the electric vehicle to the charging facility based on the map information, and the destination from the charging facility. The display unit is composed of an analysis unit that calculates the charging time of the in-vehicle battery in the charging facility based on the distance to, and the arrival time to the destination including the charging time calculated by the analysis unit. It is characterized in that it is configured to be displayed.

[0009]

92 According to the invention according to claim 1, the analysis unit of the navigation system obtains the distance from the current position of the electric vehicle to the charging facility and the distance from the charging facility to the destination from the map information of the database unit, and the distances thereof. The capacity required to drive the vehicle is calculated using the fuel efficiency of the electric vehicle, the capacity to be charged by the charging equipment is calculated from the required capacity and the remaining capacity of the in-vehicle battery, and the charging performance of the charging equipment is calculated. The charging time required to charge the capacity is calculated based on the information of.

100 Further, the display unit displays the arrival time for reaching the destination including the charging time calculated by the analysis unit.

[0010]

105 According to the second aspect of the present invention, in the navigation system of the electric vehicle according to the first aspect, the location information of the tourist facility is stored in the database unit, and the display unit is the charging equipment and its vicinity. It is characterized in that it is configured to display the above-mentioned tourist facility.

[0011]

112 According to the second aspect of the present invention, the charging facility and the tourist facility in the vicinity of the charging facility are displayed on the display unit.

[0012]

117 The invention according to claim 3 is characterized in that, in the navigation system of the electric vehicle according to claim 2, the tourist facility displayed on the display unit includes a rechargeable tourist facility.

[0013]

123 According to the third aspect of the present invention, a tourist facility having a charging facility and capable of charging is displayed on the display unit.

[0014]

128 The invention according to claim 4 is the navigation system of the electric vehicle according to any one of claims 1 to 3, wherein the display unit, the input unit, and the battery management unit are mounted on the electric vehicle. Moreover, the database unit and the analysis unit are provided in the data center, and are configured to communicate between the electric vehicle and the data center.

[0015]

136 According to the invention of claim 4, the contents set in the input unit of the electric vehicle and the information of the remaining capacity of the in-vehicle battery of the electric vehicle measured by the battery management unit are sent to the data center and sent to the database unit of the data center. The analysis unit calculates the arrival time, etc. based on the stored map information and transmits it to the electric vehicle, and displays the result on the display unit of the electric vehicle.

[0016]

145 The invention according to claim 5 is the display unit, the input unit, the battery management unit, the database unit, and the analysis in the navigation system of the electric vehicle according to any one of claims 1 to 3. All the parts are mounted on the electric vehicle.

[0017]

151 According to the invention of claim 5, the functions of the analysis unit and the database unit are mounted on the electric vehicle to calculate the distance from the current position of the electric vehicle to the charging facility and the distance from the charging facility to the destination. The capacity required to travel a distance, the capacity to be charged by the charging equipment, and the charging time at the charging equipment are calculated, and the arrival time to reach the destination including the charging time is displayed on the display unit. do.

[0018]

161 According to the invention according to claim 1, the analysis unit of the navigation system obtains the distance from the current position of the electric vehicle to the charging facility and the distance from the charging facility to the destination from the map information of

the database unit, and the distances thereof. The capacity required to drive the vehicle is calculated using the fuel efficiency of the electric vehicle, the capacity to be charged by the charging equipment is calculated from the required capacity and the remaining capacity of the in-vehicle battery, and the charging performance of the charging equipment is calculated. The charging time required to charge the capacity is calculated based on the information of.

169 Further, the display unit displays the arrival time for reaching the destination including the charging time calculated by the analysis unit.

[0019]

174 In this way, by predicting the total time to the destination including the charging time, it is possible to inform the driver of the arrival time for reaching the destination.

176 In addition, the driver can accurately predict the arrival time at the destination based on the estimated arrival time, and can make an accurate driving plan according to his / her needs based on the estimated arrival time.

[0020]

182 According to the invention of claim 2, since the charging facility and the tourist facility near the charging facility are displayed on the display unit, in addition to the effect of the invention of claim 1, the driver can mount the electric vehicle on the vehicle. It is possible to visit tourist facilities such as dining places, sightseeing spots, and leisure facilities by using the charging time of the battery, and it is possible to make a lean driving plan including meals and sightseeing.

[0021]

191 According to the invention of claim 3, since the tourist facility having a charging facility and rechargeable is displayed on the display unit, in addition to the effect of the invention of claim 2, the driver can be charged. Information on tourist facilities can be provided, and drivers can devote their charging time to meals, sightseeing, leisure, etc. without having to move back and forth between the charging equipment and the tourist facilities, which is a more lean driver's need. It is possible to make a driving plan that suits the situation.

[0022]

200 According to the invention of claim 4, the contents set in the input unit of the electric vehicle and the information of the remaining capacity of the in-vehicle battery of the electric vehicle measured by the battery management unit are sent to the data center and sent to the database unit of the data center. The analysis unit calculates the arrival time, etc. based on the stored map information and transmits it to the electric vehicle, and displays the result on the display unit of the electric vehicle.

206 Therefore, in addition to the effects of the inventions described in the above claims, the latest information on new construction or expansion of electrical equipment, changes in charging performance, road changes due to land readjustment, new construction or disappearance of tourist facilities, etc. can be obtained at the data center. It can be aggregated and collectively managed, and the latest information and the precise map information stored in the database section can be used in the calculation of the charging time by the analysis unit, improving the accuracy of route setting settings. Therefore, the calculation of the charging time to the in-vehicle battery, the traveling time of the electric vehicle, and the like becomes more accurate, and the charging time and the arrival time to the destination can be calculated more accurately.

[0023]

219 According to the invention of claim 5, the functions of the analysis unit and the database unit are mounted on the electric vehicle to calculate the distance from the current position of the electric vehicle to the charging facility and the distance from the charging facility to the destination. The capacity required to travel a distance, the capacity to be charged by the charging equipment, and the charging time at the charging equipment are calculated, and the arrival time to reach the destination including the charging time is displayed on the display unit. do.

226 Therefore, in addition to the effects of the invention described in each claim, the communication time can be omitted and the processing time can be shortened as compared with the case of centralized management in the data center.

[0024]

232 Hereinafter, embodiments of the navigation system for the electric vehicle according to the present invention will be described with reference to the drawings.

[0025]

237 FIG. 1 is a diagram illustrating an overall configuration of a navigation system according to the present embodiment.

239 The navigation system 1 of the present embodiment is composed of an electric vehicle 2, a plurality of charging facilities 3, and a data center 4 capable of communicating with these via a mobile communication network or the like, and accumulating and analyzing information.

[0026]

245 The electric vehicle 2 is provided with an input display unit 21, a battery management unit 22, and a traveling control unit 23, and each unit 21 to 23 is connected by an in-vehicle LAN.

247 Further, each unit 21 to 23 can communicate with the data center 4 via the communication

unit 24 and the mobile communication network.

[0027]

252 The input display unit 21 is configured to be able to perform various navigation operations in the same manner as a normal so-called car navigation system, and the input display unit 21 includes a display unit 25 including a display panel or the like on which a route or the like is displayed. An input unit 26 including an operation button or the like for inputting a destination or the like is provided.

257 Further, a vehicle position measuring device such as a GPS receiver or a gyro sensor (not shown) is connected to the input display unit 21, and the input display unit 21 can perform GPS navigation based on information from the vehicle position measuring device. It is configured to determine the position of the own vehicle using the method of autonomous navigation.

[0028]

265 Further, the input display unit 21 reads map information from a built-in storage medium such as a hard disk (not shown) or a DVD (not shown) and displays it on the display unit 25.

[0029]

270 Further, in the present embodiment, the input display unit 21 inputs the setting contents such as the destination and the charging equipment input from the input unit 26 in response to the input signal, the current position of the own vehicle, the fuel consumption information, and the like to the communication unit 24 and the communication unit 24. It is transmitted to the data center 4 via the mobile communication network, and information such as route information, charging equipment, charging time, required time to arrive, etc. transmitted from the data center 4 is displayed on the display unit 25. It is configured.

[0030]

280 The battery management unit 22 is a device for measuring and managing the remaining capacity of an in-vehicle battery (not shown) of the electric vehicle 2, and in the present embodiment, subtracting the capacity consumed by running from the charge capacity charged by the charging equipment 3. Is configured to calculate the remaining capacity of the in-vehicle battery.

285 The battery management unit 22 may be configured to directly measure the remaining capacity of the in-vehicle battery.

287 Further, the battery management unit 22 outputs the remaining capacity of the in-vehicle battery of the electric vehicle 2 as probe information in response to an inquiry from the data center 4.

[0031]

293 The travel control unit 23 is a device for controlling the overall travel of the electric vehicle 2, and is configured to perform various controls such as rotational drive of a wheel drive motor (not shown) in response to various operations such as pedal operation by the driver. Has been done.

297 In addition, the traveling control unit 23 responds to the destination setting information from the input display unit 21 transmitted via the in-vehicle LAN, information on the remaining capacity of the in-vehicle battery from the battery management unit 22, and the like, and the electric vehicle 2 It is configured to automatically control the traveling of the electric vehicle 2 or to automatically control the traveling of the electric vehicle 2 in response to an instruction from the data center 4 via the mobile communication network.

[0032]

306 The charging equipments 3a, 3b, 3c, ... Are provided with a charging characteristic map as charging performance information indicating the charging capacity of each charging equipment as shown in FIG.

309 These charging characteristic maps are updated every time the equipment contents of each charging equipment 3a, 3b, 3c, ... The information is transmitted to the data center 4 via the wide area communication network.

312 Further, each of the charging facilities 3a, 3b, 3c, ... Is configured to transmit information on its own operating state to the data center 4 at regular intervals or in response to an inquiry from the data center 4.

[0033]

318 Note that FIG. 2 shows a case where the charging equipments 3a and 3b can perform three types of charging, quick charging, medium speed charging, and normal charging, respectively. For example, when the charging equipment 3 can only perform normal charging. A charging characteristic map for the normal charging is transmitted to the charging facility 3, and when a plurality of charging devices having different characteristics are installed in the charging equipment 3, the charging characteristic map for each charging device is transmitted. Is configured to be transmitted to the data center 4.

[0034]

328 The data center 4 includes a communication server 41, a database server 42, a navigation server 43, and an analysis server 44, each of which is connected by a LAN.

[0035]

333 The communication server 41 is a computer for managing communication between the electric vehicle 2 or the charging facility 3 and the data center 4, and the information transmitted to the data center 4 via the router or the like 45 is transmitted to the servers 42 to 44. It is configured to be distributed and to transmit the information output from each of the servers 42 to 44 to the electric vehicle 2 and the charging facility 3 via a router or the like 45.

[0036]

342 The database server 42 is a computer that manages a database unit 46 including a large-capacity storage device and stores, reads, and erases information in the database unit 46. The database unit 46 includes navigation and other information. Information such as map information necessary for processing is stored.

346 Further, in the database unit 46, information such as the position information of the charging equipments 3a, 3b, 3c, ..., The charging characteristic map, the number of accommodating units, and the like are stored for each charging equipment, and these information are stored in each charging equipment. It is updated according to the update instruction from the equipment 3a, 3b, 3c, ...

[0037]

354 In the present embodiment, the database unit 46 also stores information such as location information of tourist facilities such as restaurants, tourist spots, and leisure facilities where food and drink can be eaten.

357 In addition, some tourist facilities are equipped with charging facilities and can be charged, and the database unit 46 also stores information on such rechargeable tourist facilities.

359 The database server 42 responds to the instruction content of reading from another server, that is, if it is reading for selecting a charging facility, it is used as charging facility information, and if it is an instruction to provide information about a tourist facility, it is used. As information about the tourist facility, information such as the location information of the rechargeable tourist facility is read out.

[0038]

367 The database unit 46 stores fuel consumption information for each model of the electric vehicle, and the electric vehicle 2 transmits the information of the model of the own vehicle, so that the database server 42 has transmitted the electric vehicle 2 to the database unit 46. It is also possible to configure the database unit 46 to read out the fuel consumption information based on the model of.

372 Further, it is configured so that the changed part of the map information stored in the database unit 46 and the updated information on the charging equipment, the tourist facility,

etc. can be transmitted to the hard disk or the like of the input display unit 21 of the electric vehicle 2 to update the information. It is also possible.

[0039]

379 The navigation server 43 searches for a route based on the setting contents such as the destination and the charging facility transmitted from the input display unit 21 of the electric vehicle 2 and the information of the current position of the electric vehicle 2, and is obtained as a result of the search. When the route or the route specified by the input display unit 21 of the electric vehicle 2 is transmitted, the node on the route as shown in FIG. 3 with reference to the map information of the database unit 46 for the route. It is configured to transmit data such as latitude and longitude of N1 to Nm and distance between nodes to the analysis server 44.

[0040]

390 The analysis server 44 corresponds to the analysis unit of the navigation system of the electric vehicle of the present invention, and is the information on the current position and fuel consumption of the electric vehicle 2 and the remaining capacity of the vehicle-mounted battery transmitted from the input display unit 21 of the electric vehicle 2. Reaching the destination from the current position of the electric vehicle 2 including the charging time at the charging facility required for charging the in-vehicle battery and the charging time at the charging facility based on the information and the settings such as the destination and the charging facility. It is configured to calculate the arrival time until it is completed.

[0041]

401 Next, the operation of the navigation system of the electric vehicle according to the present embodiment will be described.

[0042]

406 In the navigation system 1 of the present embodiment, the destination setting, the waypoint setting, and the like are first performed on the input display unit 21 of the electric vehicle 2.

408 FIG. 4 is a flowchart showing the procedure of initial setting in the input display unit.

409 First, the destination is set by operating the input unit 26 or the like of the input display unit 21 (step S1).

411 The destination can be set by inputting from the map displayed on the display unit 25 of the input display unit 21 or by inputting the address of the destination, the name of the facility / building, the zip code, and the telephone number. Or the like, a general method can be used.

414 Necessary items such as the speed of the own vehicle are set as appropriate.

[0043]

418 When the destination is set, a screen asking whether or not there is a stopover before reaching the destination is displayed on the display unit 25 (step S2), and if there is no waypoint, the destination is not available. A screen asking whether or not to perform automatic setting for automatically setting the charging equipment when the route to the destination and charging are required is displayed on the display unit 25 (step S3).

[0044]

426 Then, when automatic setting is selected (see route A in FIG. 4), the setting contents such as the destination, the current position of the electric vehicle 2, and the fuel consumption information are sent to the data center 4 according to the flowchart shown in FIG. At the same time, information on the remaining capacity of the vehicle-mounted battery is transmitted from the battery management unit 22 to the data center 4 (step S4).

[0045]

434 In the data center 4, when the transmission is received from the electric vehicle 2 (step S5), the navigation server 43 reads out the necessary part of the map information from the database unit 46 connected to the database server 42 and refers to the inter-node distance and the like. A route in which the current position of the electric vehicle 2 and the destination are the shortest distance is searched (step S6), and data such as the latitude and longitude of the node of the selected shortest route and the distance between the nodes are transmitted to the analysis server 44.

[0046]

444 As shown in FIG. 6, the analysis server 44 obtains the distance between the current position of the electric vehicle 2 and the destination by calculating the sum of the distances between all the nodes on the route.

447 Then, the capacity A1 required to reach the destination is calculated from the distance and the fuel consumption information of the electric vehicle 2, and the remaining capacity A0 of the in-vehicle battery of the electric vehicle 2 is compared with the calculated required capacity A1. If the remaining capacity A0 is smaller than the required capacity A1, it is determined that charging is necessary (step S7).

[0047]

455 When it is determined that charging is necessary, the analysis server 44 selects a charging facility 3 that can reach with the remaining capacity A0 and is close to the path among the charging facilities 3 in which the position information, the charging characteristic map, and

the like are stored in the database unit 46.

459 Then, as shown in FIG. 7, for each of the selected charging facilities, the distance from the current position of the electric vehicle 2 to the charging facility, the fuel consumption, and the required capacity to go to the charging facility are obtained by the same procedure as described above. A2 is calculated, and the traveling time T2 during that period is calculated from the set speed of the electric vehicle 2.

464 Further, the required capacity A3 and the traveling time T3 are similarly calculated for the charging equipment to the destination.

466 Furthermore, the charging characteristic map of the charging equipment is the shortest charging time T1 required to charge the minimum amount A3- (A0-A2) of the capacity that must be charged by the charging equipment to reach the destination from the current position. Calculated based on.

470 Then, a value obtained by adding the time required for the round trip from the route to the charging facility to the sum of T1, T2, and T3 (hereinafter referred to as the required time T).

472) Is selected (step S8).

[0048]

476 In the present embodiment, the data center 4 has information such as the route selected in this way, the charging facility, the charging time T1, and the required time T to the destination, as well as the location information of the tourist facility around the selected charging facility. Etc. are read from the database unit 46 and transmitted to the electric vehicle 2 (step S9).

[0049]

484 In the charging equipment selection procedure (step S8), even if the in-vehicle battery of the electric vehicle 2 is charged to a so-called full state by the charging equipment, the capacity is required until the capacity reaches the destination from the charging equipment. Charging equipment that is smaller than the capacity A3 is excluded.

488 If the capacity of all the selected charging equipments when fully charged is smaller than the required capacity A3, it is determined that a second charging is necessary, and the procedure for selecting the charging equipments is repeated again. Is done.

[0050]

494 On the other hand, when the analysis server 44 determines in the above determination (step S7) that the remaining capacity A0 is larger than the capacity A1 required to reach the destination and does not need to be charged, the route and the time required to reach the destination T. Etc. are transmitted to the electric vehicle 2 (step S9).

[0051]

501 The input display unit 21 of the electric vehicle 2 determines whether or not information such as a route has been transmitted from the data center 4 (step S10), and when the information is transmitted, the display unit 21 is as shown in FIG. The route, charging equipment, charging time, estimated time of arrival calculated from the required time T, and the like are displayed on 25 (step S11).

506 These pieces of information are stored in a storage medium such as a hard disk of the input display unit 21 and are used for subsequent navigation.

[0052]

511 In the present embodiment, as shown in FIG. 8, on the screen of the display unit 25, the route, the charging equipment, the charging time, the estimated time of arrival, the distance to the destination and the charging equipment, and the expected arrival at the charging equipment are displayed. The time etc. is displayed.

515 Further, if the vicinity of the charging facility is enlarged, as shown in FIG. 9, tourist facilities such as restaurants, sightseeing spots, and leisure facilities around the charging facility are displayed.

[0053]

521 Next, after setting the destination (see step S1 and FIG. 4), there is no particular waypoint to stop by (step S2), but if it is necessary to perform a route to the destination or charge, drive the charging place. When the person himself / herself is selected to set (see route B in FIG. 4), the route is first set according to the flowchart shown in FIG. 10 (step S12).

[0054]

528 In the route setting, the input display unit 21 of the electric vehicle 2 reads map information including information such as the latitude and longitude of the node from a storage medium such as a built-in hard disk or DVD, and is set from the current position of the electric vehicle 2. Several recommended routes are selected as routes to the destination, and for example, those routes are displayed on the display unit 25 as shown in FIG. 11 and set by the driver.

533 The necessary information may be transmitted to the data center 4 so that the data center 4 can select the recommended route.

[0055]

538 When the route is set, the input display unit 21 is required to reach the destination from the sum of the distances between all the nodes and the fuel consumption information of the electric vehicle 2 for the route, as shown in FIG. The capacity A1 is calculated, and the remaining capacity A0 of the vehicle-mounted battery of the electric vehicle 2 is compared

with the calculated required capacity A1.

543 The input display unit 21 determines that charging is not necessary if the remaining capacity A0 is larger than the required capacity A1 (step S13), and as shown in FIGS. 8 and 9, the display unit 25 shows the route and the required time. The estimated time of arrival calculated from T is displayed (step S20).

547 However, in this case, the charging equipment, charging time, etc. are not displayed.

[0056]

551 Further, when the input display unit 21 determines that charging is necessary (step S13), the input display unit 21 calculates the reachable distance with the remaining capacity A0 of the vehicle-mounted battery, and displays a screen as shown in FIG. 12, for example, the display unit 25. Is displayed, and the driver is asked to set a place for charging (step S14).

555 In FIG. 12, the reachable distance is shown by a solid line from the current position, and a place name that can be a charging place is displayed.

[0057]

560 When the charging location is set, information such as the set destination, charging location, speed of the own vehicle, current position and fuel consumption of the own vehicle, remaining capacity of the in-vehicle battery, etc. is transmitted to the data center 4 (Step S15).

[0058]

567 In the data center 4, when the transmission is received from the electric vehicle 2 (step S16), the navigation server 43 uses the map information stored in the database unit 46 connected to the database server 42 to indicate the latitude and longitude of the nodes related to the setting route and between the nodes. The distance and the like are read out and transmitted to the analysis server 44.

[0059]

575 The analysis server 44 selects the charging equipment belonging to the set charging location from the charging equipment 3 in which the position information, the charging characteristic map, and the like are stored in the database unit 46.

578 Then, the charging equipment that minimizes the required time T from the current position of the electric vehicle 2 to the destination is selected by the calculation method as shown in FIG. 7 (step S17).

[0060]

584 Then, the data center 4 stores information such as the charging equipment selected in this way, the charging time T1 and the required time T to the destination, as well as the location information and the like of the tourist facilities around the selected charging equipment in the database unit 46. Is read from and transmitted to the electric vehicle 2 (step S18).

[0061]

591 The input display unit 21 of the electric vehicle 2 determines whether or not information such as a route has been transmitted from the data center 4 (step S19), and when the information is transmitted, FIG. A screen as shown in 9 is displayed (step S20).

594 Further, these pieces of information are stored in a storage medium such as a hard disk of the input display unit 21 and used for subsequent navigation.

[0062]

599 It is also possible to configure the charging equipment to be set in the charging location setting (step S14).

601 For example, after the charging location is set or instead of setting the charging location, the name, address, area name, etc. of the charging equipment can be input and selected, or all the charging equipment belonging to the charging location can be displayed on the display unit 25 or in advance. Display a list of the specified number and let them select from them.

605 Further, the display unit 25 may display a map of the charging location, and the charging equipment may be selected from the screen. At that time, if the tourist facilities are displayed at the same time, the tourist facilities visited during charging may be taken into consideration. It is preferable because the charging equipment can be selected.

[0063]

612 Next, if there is a stopover that you want to stop by before going to the destination, after setting the destination (see steps S1 and FIG. 4), set the waypoint (step S21).

614 Then, when the waypoint is set (see route C in FIG. 4), the setting contents such as the destination, the waypoint, the speed of the own vehicle, the current position of the own vehicle, and the fuel consumption information are obtained according to the flowchart shown in FIG. It is transmitted to the data center 4, and at the same time, information on the remaining capacity of the vehicle-mounted battery is transmitted from the battery management unit 22 to the data center 4 (step S22).

[0064]

623 In the data center 4, when the transmission is received from the electric vehicle 2 (step S23), the navigation server 43 reads out the necessary part of the map information from the database unit 46 connected to the database server 42 and refers to the inter-node distance

and the like. A route is searched for the shortest distance between the current position and waypoints of the electric vehicle 2 and between the waypoints and destinations (step S24), and data such as the latitude and longitude of the node of the selected shortest route and the distance between nodes are obtained. It is transmitted to the analysis server 44.

[0065]

633 In the analysis server 44, first, as shown in FIG. 14, it is necessary to reach the waypoint from the sum of the distances between the nodes between the current position of the electric vehicle 2 and the waypoint and the fuel consumption information of the electric car 2. The capacity A4 is calculated, the remaining capacity A0 of the in-vehicle battery of the electric vehicle 2 is compared with the calculated required capacity A4, and if the remaining capacity A0 is smaller than the required capacity A4, it is determined that charging is necessary (). Step S25).

[0066]

643 When it is determined that charging is necessary, the analysis server 44 selects a charging facility 3 that can reach with the remaining capacity A0 and is close to the path among the charging facilities 3 in which the position information, the charging characteristic map, and the like are stored in the database unit 46.

647 Then, the charging time T1 is calculated by the same method as the calculation method shown in FIG. 7, and the required time T4 from the current position of the electric vehicle 2 to the waypoint is minimized from each of the selected charging facilities. The charging equipment is selected (step S26).

[0067]

654 Further, when it is determined in the above determination (step S25) that charging is not necessary, the analysis server 44 in turn calculates the sum of the internode distances between the waypoint and the destination, as shown in FIG. The capacity A5 required to reach the destination is calculated from the fuel consumption information of the electric vehicle 2, and the remaining capacity A0-A4 of the in-vehicle battery of the electric vehicle 2 is compared with the calculated required capacity A5 to remain. If the capacity A0-A4 is larger than the required capacity A5, it is determined that charging is not necessary (step S27).

662 In this case, the electric vehicle 2 does not need to be charged from the current position to the destination via the waypoint.

[0068]

667 Further, when it is determined in the determination (step S27) that charging is necessary, the

analysis server 44 determines that the charging time T1 is the minimum from the charging equipment near the waypoint, and the charging time T1 is also taken into consideration from the waypoint. A charging facility that minimizes the time required to reach the destination T5 is selected (step S28).

[0069]

675 Information such as the route selected and calculated as described above, the required time T (= T4 + T5), and if selected, information on the charging equipment and charging time T1, as well as information on tourist facilities near the stopovers, etc. It is transmitted to the electric vehicle 2 (step S29).

[0070]

682 The input display unit 21 of the electric vehicle 2 determines whether or not information such as a route has been transmitted from the data center 4 (step S30), and when the information is transmitted, FIG. A screen as shown in 9 is displayed (step S31), and the selected route or the like is stored in a storage medium such as a hard disk of the input display unit 21 and used for subsequent navigation.

[0071]

690 In the selection of the charging equipment near the waypoint (step S28), as described above, the analysis server 44 of the data center 4 may be configured to automatically select the optimum charging equipment. At that stage, information may be transmitted to the electric vehicle 2 to allow the driver to select the charging equipment.

[0072]

697 At that time, for example, if the screen as shown in FIG. 16 is displayed on the display unit 25 of the input display unit 21, the charging equipment can be selected according to the time spent at the waypoint.

700 That is, for example, the charging stand A shown in FIG. 16 may be selected if the work at the waypoint is completed immediately, and the charging stand if the work at the waypoint takes a relatively long time. B may be selected.

703 In this way, it becomes possible to more accurately meet the needs of the driver.

[0073]

707 As described above, according to the navigation system of the electric vehicle of the present embodiment, the total required time T including the charging time T1 from the current position of the electric vehicle 2 to the destination is predicted and provided as information.

Therefore, for example, if you want to reach the destination as soon as possible, you can know the route that can reach the destination in the shortest time and the position of the charging equipment by selecting the automatic setting of the route and charging equipment, and how many minutes It becomes possible to recognize whether it can be reached later.

[0074]

717 Also, for example, if you have time to spare and want to use the charging time of the in-vehicle battery to eat or go sightseeing, if there is a tourist facility you want to visit, set it as a stopover and use the navigation system. To set the route, decide whether to visit the tourist facility while checking the calculated arrival time to the final destination, and decide whether to change to another tourist facility. Can be done.

[0075]

725 Further, as shown in FIG. 12, it is possible to have the navigation system recommend a charging place and select a facility to be visited from the tourist facilities in the charging place.

[0076]

731 As described above, according to the navigation system of the electric vehicle of the present embodiment, it is possible to accurately meet the different needs of each driver, and the driver looks at the arrival time at the final destination and the like. It is possible to make an accurate and lean driving plan including meals and sightseeing.

[0077]

738 Further, if the navigation system is composed of an electric vehicle, a charging facility, and a data center as in the present embodiment, the charging facility is newly installed or expanded, the charging performance is changed, the road is changed due to land readjustment, and the tourist facility is newly installed. Since the latest information on the disappearance and the like can be collectively managed in the data center and the precise map information stored in the database unit 46 can be used, the setting accuracy of the route setting is improved and the vehicle-mounted battery is used. It becomes possible to more accurately calculate the charging time of the electric vehicle and the running time of the electric vehicle.

[0078]

750 When the charging equipment is selected on the display unit 25 of the input display unit 21, it may be difficult to distinguish if a large number of charging equipments are displayed.

752 In such a case, it should be configured to display in different colors according to the difference in the charging performance of the charging equipment, whether or not quick charging is possible, or to display in different colors according to the length of time required for charging. Is also possible.

[0079]

759 You may also want to know how long it will take to charge an in-vehicle battery to a full state with a charging facility and what time it will arrive at your destination.

761 In that case, when the analysis server 44 of the data center 4 calculates the charging time T1, the charging time required to charge the in-vehicle battery to the full state is also calculated at the same time. It is also possible to configure the display unit 25 of the input display unit 21 shown in FIGS. 9 and 16 to display the battery together with the shortest charging time.

[0080]

768 Further, in the calculation of the capacity required for moving between the current position, the destination, the charging facility, the waypoint, etc. of the electric vehicle 2 shown in FIGS. 6 and 14, the value of the distance between the nodes is simply calculated as described above. In addition to finding the distance using the above, it is also possible to configure the probe information such as the capacity consumption when another electric vehicle 2 travels between the nodes.

774 Specifically, by transmitting information on the remaining capacity of the in-vehicle battery from the electric vehicle 2 to the data center 4 each time the vehicle passes through the node, it is possible to collect data on the capacity actually consumed by the movement between the nodes.

778 If the consumed capacity is stored in the database unit 46 as data between nodes, the capacity of the route can be calculated in calculating the capacity required for traveling between the current position of the electric vehicle 2, the charging facility, the waypoint, and the destination. By calculating the sum of the consumed capacities associated between each node, it is possible to calculate the consumed capacity more realistically.

[0081]

786 On the other hand, as shown in FIG. 17, all the functions of the database server 42, the navigation server 43, and the analysis server 44 of the data center 4 are provided in the input display unit 21 of the electric vehicle 2, and the navigation system 1 is mounted on the electric vehicle 2. It is also possible to configure it as such.

790 At that time, as the database unit 46, a built-in hard disk or a storage medium such as a CD or a DVD is used.

[0082]

795 With such a configuration, the communication time with the data center 4 can be omitted as compared with the embodiment, so that there is an effect that the processing time is shortened.

798 Further, the latest information such as new installation or expansion of charging equipment and change of charging performance can be obtained by taking in the information from the storage medium in which the information is recorded or transmitting the information to the data center 4.

[0083]

805 It is a figure explaining the whole structure of the navigation system which concerns on this embodiment.

807 It is a figure explaining the charge characteristic map which shows the charge capacity of a charging facility.

809 It is a figure explaining the node on the path.

810 It is a flowchart which shows the procedure of the initial setting in an input display part.

811 It is a flowchart which shows the processing procedure when the automatic setting is selected.

813 It is a figure explaining the calculation method of the capacity required to reach a destination.

814 It is a figure explaining the relationship between the charge time and the required capacity in each section on a route, and a running time.

816 It is a figure which shows the display part which displayed the route, the charging equipment, the charging time, and the like.

818 It is a figure which shows the display part which displayed the charging equipment and the tourist facility around it.

820 It is a flowchart which shows the processing procedure when the setting of a route and a charging place is selected.

822 It is a figure which shows a plurality of routes displayed for route setting.

823 It is a figure which shows the path which the reachable distance by the remaining capacity is represented by a solid line.

825 It is a flowchart which shows the processing procedure when the waypoint setting is selected.

826 It is a figure explaining the calculation method of the capacity required to reach the waypoint from the present position.

828 It is a figure explaining the calculation method of the capacity required to reach a destination from a waypoint.

830 It is a figure which shows the screen which is displayed on the display part for selecting the charging equipment near a waypoint.

832 It is a figure which shows the configuration when the navigation system is mounted on an electric vehicle.

834 Description of the sign

[0084]

838 1 Navigation system 2 Electric vehicle 22 Battery management unit 25 Display unit 26 Input unit 3, 3a, 3b, 3c Charging equipment 4 Data center 44 Analysis server 46 Database unit

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

Application Number	18/340,781
Filing Date	06/23/2023
First Named Inventor	Jeffrey R. Ambroziak
Art Unit	3649
Client Number	CF01
Matter Number	001-02-07

GENERAL

Pursuant to 37 C.F.R. 1.97 and 1.98 and to the duty of disclosure set forth in 37 C.F.R. 1.56, the Examiner in charge of the above-identified application is requested to consider and make of record the references listed herewith. A copy of each listed reference, other than U.S. patents/applications and references cited in a parent application, is enclosed.

Although the information submitted herewith may be "material" to the Examiner's consideration of the subject application, this submission is not intended to constitute an admission that such information is "prior art" as to the claimed invention.

In accordance with 37 C.F.R. 1.97(g), the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made.

TIMING

In accordance with 37 CFR 1.97(b), this Information Disclosure Statement is being filed within three months of the filing of a national application other than a continued prosecution application under 37 CFR 1.53(d); within three months of the date of entry of the national stage as set forth in 37 CFR 1.491 in an international application; before the mailing of a first Office Action on the merits; or before the mailing of a first Office Action after the filing of a request for continued examination under 37 CFR 1.114.

CERTIFICATION STATEMENT

No certification statement is required. This Information Disclosure Statement is being filed in accordance with 37 CFR 1.97(b).

FEE

No fee is required. This Information Disclosure Statement is being filed in accordance with 37 CFR 1.97(b).

If necessary, the Director is hereby authorized to charge or credit Deposit Account No. 50-5363 for any additional fees, or any underpayment or credit for overpayment in connection herewith. Please reference attorney docket number CF01-001-02-07 for any such charge or credit.

ADDITIONAL COMMENTS

SIGNATURE

Signature	/ Carson C.K. Fincham, Reg. No. 54096 /	**Date**	2023-08-04
Name	Carson C.K. Fincham	**Registration Number**	54096

Notice

DESCRIPTION JP2003294463A

[0001]

13 INDUSTRIAL APPLICABILITY The present invention relates to a navigation system that presents information such as a current position and a traveling route in an electric vehicle.

[0002]

18 BACKGROUND OF THE INVENTION In an electric vehicle powered by a battery-powered motor, how far the vehicle can travel with the remaining capacity of the battery, that is, the reachable range, is important for making a travel plan.

21 Therefore, an attempt to provide such information by an in-vehicle navigation system is disclosed in, for example, Japanese Patent Application Laid-Open No. 2001-112121. In this conventional electric vehicle navigation system, the current position is displayed on a map by a display, and whether or not the destination reached by the destination input to the navigation system can be reached by the map information and the remaining capacity of the battery. When it is difficult to reach the destination, it is notified that it is difficult to reach the destination by indicating the required battery charging time.

[0003]

31 However, the conventional navigation system for an electric vehicle indicates the battery charging time required only when it is difficult to reach the destination. Therefore, the present invention is present. No particular notification is given if the remaining capacity of the battery is sufficient to reach the destination.

35 Therefore, it is possible that the remaining capacity of the battery is almost exhausted when the destination is reached.

[0004]

40 However, unlike gas stations, the popularity of battery charging equipment for electric vehicles is still low.

42 Therefore, if the charging equipment is not installed at the destination and the remaining capacity of the battery is close to zero, there is a risk that the vehicle will not be able to travel to the next destination even if it tries to move next time. be. Therefore, in view of the above problems, it is an object of the present invention to provide a navigation system for an electric vehicle capable of calling attention so that the next driving can be surely performed even after reaching the destination.

[0005]

51 Means for Solving the Problem Therefore, in order to inform the driver and the like that not only the electric power for reaching the destination but also the electric power for further advancement or return should be taken into consideration, the present invention can be charged. It is determined by the determination means whether or not the battery can be charged at the destination, and when it is determined that the battery cannot be charged at the destination, the charging equipment near the destination searched by the charging equipment search means is displayed on the display. I decided to do it.

58 By displaying the charging equipment near the destination, you will be alerted in advance about the remaining capacity of the battery, so make an appropriate driving plan without falling into a situation where you cannot drive next after reaching the destination. Can be done.

[0006]

65 BEST MODE FOR CARRYING OUT THE INVENTION Hereinafter, embodiments of the present invention will be described.

67 FIG. 1 is a block diagram showing a configuration of an embodiment. A motor (M) 30 driven by the electric power of a battery (BAT) 10 mounted on an electric vehicle is connected to a drive wheel 36 from a speed reducer 32 via a drive shaft 34. An inverter (INV) 20 is provided between the battery 10 and the motor 30, and the direct current of the battery 10 is converted into three-phase alternating current and supplied to the motor 30. The inverter 20 is controlled by a control signal from a controller (not shown), whereby the rotation of the motor 30 is controlled.

[0007]

77 An AC outlet 14 connected to a commercial AC power supply 12 and a charger outlet 18 connected to an external dedicated charger 16 are connected to the battery 10 for charging, and the battery 10 is selected and used according to the form of the charging equipment. You

can do it.

81 The output line of the battery 10 is provided with a current sensor (A) 22 for detecting the battery current and a voltage sensor (V) 24 for detecting the terminal voltage of the battery 10, and these current sensors 22 and the voltage sensor 24 are batteries. It is connected to the control unit (BAT-C / U) 26.

[0008]

88 The battery control unit 26 calculates the remaining capacity of the battery 10 based on the detection data from the current sensor 22 and the voltage sensor 24, and outputs the result to the navigation control unit (NAVI-C / U) 40. ..

91 The battery control unit 26 continuously calculates the remaining capacity of the battery 10 and outputs it to the navigation control unit 40 at predetermined time intervals while a key switch (not shown) of the electric vehicle is turned on. The battery control unit 26 constitutes the battery remaining amount detecting means in the present invention.

[0009]

98 A vehicle speed sensor 42 for detecting the traveling speed, a GPS antenna 44, and a gyro sensor 46 are connected to the navigation control unit 40 for detecting the current position, and a display 50 and an input / operation unit 52 are connected to the navigation control unit 40. ..

102 The input / operation unit 52 includes a keyboard 54 and a touch panel 56 provided on the display 50, and the user can perform various inputs and selection operations by the input / operation unit 52. A DVD-ROM 58 storing map information is further connected to the navigation control unit 40, and the map information also includes information regarding the location of charging equipment such as a charging stand.

[0010]

110 The navigation control unit 40 detects the current position and displays a map of the surrounding area by satellite navigation using GPS data captured from the GPS antenna 44 and self-contained navigation using data from the vehicle speed sensor 42 and the gyro sensor 46. Display at 50.

114 Further, it is possible to calculate and display the optimum route with the lowest power consumption and efficiency corresponding to the destination input from the input / operation unit 52.

[0011]

120 The navigation control unit 40 further determines whether or not the destination can be reached based on the remaining capacity of the battery 10, and is provided with the

following control functions for that purpose.

123 First, when there is no charging facility at the destination, the nearby charging facility is displayed on the display 50 so that it can be selected, and it is determined whether or not the vehicle can travel to the selected charging facility and information is presented on the display 50. If the destination or charging equipment cannot be reached with the current remaining battery capacity, the minimum required charging time is presented. When charging for the minimum charging time is not possible, information on how far the vehicle can be driven with charging for an arbitrary time is presented. If there are narrow roads or downtown areas on the optimal route and you want to avoid them, determine the possibility of reaching the destination on another route.

[0012]

135 2 to 4 are flowcharts showing the flow of the control related to the determination of reachability by the navigation control unit 40.

137 First, when the key switch of the electric vehicle (hereinafter referred to as a vehicle) is turned on, the navigation control unit 40 is activated together with the various systems of the vehicle, and the control is started. In step 101, the destination and the waypoint are input by using the touch panel 56 of the display 50.

[0013]

144 FIG. 5 shows an input procedure for a destination and a destination.

145 First, the display 50 displays a menu as shown in (a) as an initial screen. In (a), only the "destination search" button is shown for simplicity. When the operator touches or presses the display portion with a finger and selects "destination search", the screen asking for the number of transit destinations shown in (b) is displayed, and the number of transit destinations is input from the keyboard 54.

[0014]

153 When the "Next" button is pressed, the guidance of "Transit destination 1" is first displayed on the screen of (c) according to the number of transit destinations.

155 When this guidance button is pressed, the first transit destination input process is started. In the following, the operation of the buttons on the touch panel 56 will be referred to as simply pressing, and in particular, when one of a plurality of buttons is selected and pressed, it will be referred to as selection. The button displayed on the display 50 as the touch panel 56 is configured to change color when pressed or selected, so that the operator can confirm his / her operation. In the figure below, the hatching indicates that the color has changed.

[0015]

164 First, a character list is displayed as shown in (d), and a screen for selecting the initial letter of the transit destination is displayed.

166 If "A" is selected here, the reading shown in (e) will be a screen displaying a list of place names and landmarks starting with "A", so for example, "Atsugi Station" can be selected. When the first way destination is determined in this way, the screen of (f) for selecting the initial letter of the way destination similar to (d) is displayed for the second way destination input. If "i" is selected here, a screen displaying a list of place names and the like whose reading starts with "i" as shown in (g) of FIG. 6 is displayed.

[0016]

175 In addition to the preset list of place names, the "No item" button is also displayed on the screens (e) and (g) above, so if the place name you are going to go through is not in the list, , Press this "No item".

178 Then, the screen for asking for the address, telephone number, etc. as shown in (h) is displayed, so input from the keyboard 54 and press the "Next" button. If the route destination can be recognized from the entered information, the message "The route destination has been recognized" is displayed as shown in (j). Here, if the transit destination cannot be recognized from the information input from the keyboard 54, the screen of (h) is repeated.

[0017]

187 When the route destination is recognized, the destination input process is started by pressing "Next" on the screen of (j).

189 Here, the destination is selected and input on the screens (k) and (m) similar to the route destination input process. When the destination is selected from the list or the destination is recognized by the information input from the keyboard 54, the confirmation screen of each waypoint and destination as shown in (n) is displayed, so the "OK" button is displayed. Select to finish entering the destination and destination. If you need to make changes, you can press the "Modify" button to return to the previous screen in sequence, so you can select or re-enter the keyboard.

[0018]

199 Returning to the flowchart, in step 102, information on whether or not charging at the destination is possible is input.

201 Therefore, the display 50 displays a selection screen as shown in FIG. 7. If the operator knows that there is a charging facility at the destination, select the "Yes" button, and if there is no charging facility or does not know that there is a charging facility, click the "Unknown" button. push. In step 103, it is checked which button is selected, and if there is no charging facility (unknown), the process proceeds to step 111, and if there is a charging facility, the

process proceeds to step 104.

[0019]

210 In step 104, as shown in FIG. 8, it is displayed that the information input is completed, and it waits for the "Next" button set on the screen to be pressed.

212 When the "Next" button is pressed, in step 105, the optimum route to the destination is searched for using the map information of the DVD-ROM based on the information input as described above. While searching for the optimum route, the display 50 displays to that effect as shown in FIG. 9A.

[0020]

219 In step 106, using the remaining capacity of the battery 10 input from the battery control unit 26 at predetermined time intervals, the destination by the above optimum route (when a charging facility near the destination described later is selected or input is set). Calculates whether it is possible to drive to the charging facility).

223 Then, when the remaining capacity is insufficient for traveling to the destination (or charging equipment), the required charging time is also calculated.

[0021]

228 In step 107, the above calculation result is checked, and if travel is possible, in step 108, as shown in FIG. 9B, the route from the current value to the destination via the route destination is displayed, and the optimum route is displayed. Notify that it is possible to drive with.

232 Then, wait for the "Next" button set on the screen to be pressed.

[0022]

236 When the "Next" button is pressed, in step 109, the screen moves to an approval screen having an "OK" button and a "NO" button as shown in (c) of FIG. 9, and requests approval for driving on the optimum route. ..

239 Here, it is possible to select the change of the traveling section when there is a problem in the optimum traveling route due to circumstances. When the button is pressed, which button is pressed is checked in step 110, and if the "OK" button approves the running on the optimum route, this flow ends.

[0023]

246 The "Unknown" button is pressed when inputting information about the charging equipment in step 102, and in step 111 branched from step 103, the screen shown in FIG. 10 (a) is

displayed, and if charging is not performed, the next run will be hindered. Notify you of the possibility of exiting and wait for the "Next" button to be pressed.

[0024]

253 When the "Next" button is pressed, the process proceeds to step 112 to display the charging equipment near the destination.

255 As shown in FIG. 10B, the position of the charging equipment is displayed together with the ring R indicating the distance from the destination at predetermined intervals around the destination, and when there are a plurality of charging equipments, the charging equipment is displayed. It is designed to be displayed in each direction.

259 Here, the state where the A charging stand is located 500 m diagonally forward from the destination and the B charging stand is located approximately 1 km to the left of the destination is displayed.

[0025]

265 When the "Next" button is clicked on this screen, in step 113, the screen moves to the screen of (c) in FIG. 10 and it is confirmed whether or not the charging equipment displayed on the screen of (b) is desired to be used. I do.

268 The operator presses the "OK" button if there is a charging facility that he / she wants to use, and presses the "NO" button if there is none.

[0026]

273 When the "OK" button is pressed, the process proceeds to step 114, and the screen changes to the desired charging equipment selection screen shown in FIG. 10 (d).

275 On this screen, the A charging stand and the B charging stand shown in the screen of FIG. 10B are displayed in a list, and the "Next" button is displayed. The operator selects one from the displayed list of charging equipment. After that, when the "Next" button is pressed, the process proceeds to step 104.

[0027]

282 If there is no charging equipment desired to be used in the screen of FIG. 10 (c) in step 113 and the "NO" button is pressed, the process proceeds to step 115, the screen of FIG. 11 is displayed, and the vehicle travels back and forth. Ask if you want to do it.

285 The operator presses the "OK" button on the screen when traveling back and forth, and presses the "NO" button when not traveling back and forth. When the "OK" button is pressed, the process proceeds to step 104.

[0028]

291 When the "NO" button is pressed here, in step 116, the charging location designation screen shown in FIG. 12 (a) is displayed, and the address, telephone number, or most of the charging equipment desired by the operator is displayed. A near target is input from the keyboard 54.

295 If the charging location cannot be recognized from the entered address or the like, the screen display of (a) is repeated. When the charging location is recognized, the process proceeds to step 117, and as shown in FIG. 12 (b), the fact that the charging location has been recognized and the recognized charging location are displayed, and then the process proceeds to step 104.

[0029]

303 Next, when the check in step 107 determines that the vehicle cannot travel to the destination due to the remaining capacity of the battery 10, the vehicle proceeds to step 118 and travels along with the optimum route as shown in FIG. 13 (a). Display the screen to the effect that it is impossible.

307 When the "Next" button is pressed on this screen, the screen of FIG. 13B is displayed, the charging time obtained in step 106 is shown as the minimum charging time, and it is confirmed whether or not charging is started. In addition to the "Charge" button, this confirmation screen also has a "Charge time specification" button so that you can specify a charging time that is different from the minimum charging time. The operator selects one of the buttons.

[0030]

316 In step 119, it is checked whether the "charge" button is pressed, that is, whether the start of charging is approved, and if the "charge" button is pressed, the process proceeds to step 109.

318 When the "Charge time designation" button is pressed, the process proceeds to step 120 to display the desired charge time input screen as shown in FIG. 14 (a). When the operator inputs the desired time from the keyboard 54 on this input screen and the "Next" button is pressed, in step 121, the post-charging travelable area is displayed as shown in FIG. 14 (b). On this screen, the travelable range with the battery charged for the time entered in screen (a) is represented by the distance centered on the current value, and major landmarks such as hospitals and elementary schools are also displayed. To.

[0031]

328 When the "Next" button is pressed on this screen, in step 122, as shown in FIG. 14 (c), the "OK" button and the "NO" button ask whether or not to change the travel plan. Display the plan change screen.

331 In step 123, it is checked which button is pressed, and when the "OK" button is pressed, the

process returns to step 101 and returns to the destination input screen from FIG. On the other hand, if the "NO" button is pressed, the process proceeds to step 124. In step 124, as shown in FIG. 14 (d), the same charging time as shown on the screen of FIG. 13 (b) is displayed, and it is announced that charging is necessary when heading to the original destination. And finish.

[0032]

340 If the "NO" button is pressed in the check of step 110 related to route approval, the process proceeds to step 125 and each section on the optimum travel route is selected as shown in FIG. 15 (a). Display the desired change section input screen that can be changed.

343 When the section to be changed is selected with the button and the "Next" button is clicked, a message to search for another route of the selected section is displayed as shown in FIG. 15 (b). Then, when the "Next" button on this screen is pressed, in step 126, a plurality of different routes excluding the optimum route in the desired change section are searched.

[0033]

350 In step 127, the search result is displayed on the screen as shown in FIG. 15 (c).

351 Here, an example is shown in which three routes, another route 1 to another route 3, are searched and displayed when a route between the route destination 2 and the destination is selected as the desired change section. When the "Next" button is pressed on this other route display screen, the process proceeds to the travel route selection screen shown in FIG. 15 (d) in step 128. The operator selects one from a plurality of different routes displayed on the screen and presses the "Next" button.

[0034]

360 As a result, in step 129, the screen shifts to the travel route determination screen as shown in FIG. 15 (e), the selected alternative route is displayed, and it is calculated whether or not the travel to the destination by the alternative route is possible. After displaying the message to that effect, the process returns to step 106.

[0035]

367 In the above flow, step 101 constitutes the destination setting means in the invention, steps 102 and 103 constitute a charging possibility determination means, and step 112 constitutes a charging equipment search means.

370 Further, steps 105, 109, 110, 125-129 constitute a route setting means, steps 106 and 121 are reachability determination means, steps 113 and 114 are charging equipment selection means, and steps 116 and 117 are charging equipment. The setting means, and step 120 constitutes the charging time setting means.

[0036]

377 This embodiment is configured as described above, and if the operator can input the destination together with the route destination and also determine whether or not the battery 10 can be charged at the destination based on the input information, if charging is possible. The reachability of whether or not the vehicle can travel to the destination with the remaining capacity of the current battery is calculated and displayed on the display 50. However, if the destination does not have a charging facility, the charging facility near the destination is displayed. It is displayed and selected, and it is determined and displayed whether or not the battery 10 can run to the charging facility with the remaining capacity of the battery 10.

386 As a result, it is possible to prevent a situation in which the battery 10 has reached the destination but the remaining capacity of the battery 10 is exhausted and the next run cannot be performed.

389 In addition, since the charging equipment near the destination can be known in advance, there is no need to search for the charging equipment near the destination.

[0037]

394 Also, instead of selecting the charging equipment near the destination, the operator can input the charging equipment by himself, so we decided to use the charging equipment that we are familiar with and judge whether it is reachable or not. You can also do it.

397 Similarly, it is possible to determine whether or not the reciprocating travel from the current location to the destination is possible with the remaining capacity of the battery 10 by the operator's selection operation, so that the options for the travel plan are expanded.

[0038]

403 Then, when it is possible to travel to the destination or the charging facility with the remaining capacity of the battery 10, the display 50 indicates that the vehicle can travel along with the route, so that the route from the current location to the destination directly or selected. , You can go to the destination with peace of mind after understanding and understanding the route to the destination, the round-trip route, etc. via the charging equipment set as input.

409 On the other hand, when it is impossible to travel to the destination or the charging equipment due to the remaining capacity of the battery 10, the minimum charging time required to reach the destination or the charging equipment is calculated and displayed on the display 50. You can clearly know the required charging time.

[0039]

416 Further, the operator can arbitrarily set the charging time. For example, when the charging time is set shorter than the above-mentioned minimum charging time, the remaining capacity of the battery 10 at the time when the charging is completed is calculated. Since the reachable range of the remaining capacity is displayed on the display 50, the travel plan can be changed within the reachable range.

[0040]

424 As for the route to the destination, the optimum route is calculated based on the map information, so that the destination can be reached most efficiently.

426 Then, since the operator can select another route, it is possible to know whether or not the remaining capacity of the battery 10 is reachable for any route.

[0041]

431 In the embodiment, the input / operation unit 52 is composed of the keyboard 54 and the touch panel 56, but the input / operation unit 52 is not limited to this, and various man machines such as those by voice recognition and those by image recognition in the line-of-sight direction are used. An interface can be adopted.

435 Further, the screen display on the display is merely an example, and any display form can be adopted.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	18340781
Filing Date	2023-06-23
First Named Inventor	Jeffrey R. Ambroziak
Art Unit	3649
Examiner Name	TBD
Attorney Docket Number	CF01-001-02-07

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1	Notice of Allowance for Application No. 117/012,325 (Attorney Docket No. CF01-001-02-02) dated March 12, 2021; 12 pps.	☐
	2	Notice of Allowance or Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated September 21, 2020; 16 pps.	☐
	3	Defendant Disclosure of Preliminary Proposed Claim Term Constructions (Charge Fusion Technologies, LLC v. Tesla, Inc., W.D.TX, 6:21-cv-01078-ADA) of U.S. Patents 9,853,488 / 10,819,135 / 10,998,753 for Application Nos. 12/502,041 / 15/848,017 / 17/012,325 (Attorney Docket Nos. CF01-001-02 / CF01-001-02-01 / CF01-001-02-02) dated April 29, 2022; 9 pps.	☐
	4	Defendant Motion to Dismiss (Charge Fusion Technologies, LLC v. Tesla, Inc., W.D.TX, 6:21-cv-01078-ADA) of U.S. Patents 9,853,488 / 10,819,135 / 10,998,753 for Application Nos. 12/502,041 / 15/848,017 / 17/012,325 (Attorney Docket Nos. CF01-001-02 / CF01-001-02-01 / CF01-001-02-02) dated January 7, 2022; 18 pps.	☐
	5	Defendant Preliminary Invaldity Contentions (Charge Fusion Technologies, LLC v. Tesla, Inc., W.D.TX, 6:21-cv-01078-ADA) of U.S. Patents 9,853,488 / 10,819,135 / 10,998,753 for Application Nos. 12/502,041 / 15/848,017 / 17/012,325 (Attorney Docket Nos. CF01-001-02 / CF01-001-02-01 / CF01-001-02-02) dated April 1, 2022; 51 pps.	☐
	6	Final Office Action for Application No. 117/012,325 (Attorney Docket No. CF01-001-02-02) dated February 12, 2021; 16 pps.	☐
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	Attorney Docket Number	CF01-001-02-07

	10	Inter Partes Review Decision (DENIED) of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated August 24, 2022; IPR PR2022-00519; 12 pps.	☐
	11	Inter Partes Review Notice of filing date accorded, Inter Partes Review of U.S. Patent 10,819,135 for Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated November 17, 2022; IPR2023-00063; 5 pps.	☐
	12	Inter Partes Review Notice of filing date accorded, Inter Partes Review of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated August 4, 2022; IPR 2022-01217; 5 pps.	☐
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	15	Inter Partes Review Petition of U.S. Patent 10,819,135 for Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated October 21, 2022; IPR2023-00063; 232 pps.	☐
	16	Inter Partes Review Petition of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated July 22, 2022; IPR 2022-01217; 594 pps.	☐
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	20	Inter Partes Review Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated November 4, 2022; IPR 2022-01217; 121 pps.	☐

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	Art Unit	3649
	Examiner Name	TBD
	Attorney Docket Number	CF01-001-02-07

	21	Inter Partes Review: Decision Granting Institution of Inter Partes Review for U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated February 01, 2023; IPR 2022-01217; 27 pps.	☐
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	24	Inter Partes Review: Petitioner's Reply to Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated December 09, 2022; IPR 2022-01217; 15 pps.	☐
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	37	Notice of Allowance dated 01/05/2023 for US App. No. 17829408 (Attorney Docket No. CF01-001-02-05) (pages 1-13)	☐
	38	Notice of Allowance dated 09/14/2022 for US App. No. 17829408(Attorney Docket No. CF01-001-02-05) (pages1-15)	☐
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	Attorney Docket Number	CF01-001-02-07

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Carson C.K. Fincham, Reg. No. 54,096/	Date (YYYY-MM-DD)	2023-08-04
Name/Print	Carson C.K. Fincham	Registration Number	54096

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/340,781	**08/04/2023 02:03:47 PM ET**	**CF01-001-02-07**

Title of Invention

SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8229	FILED BY	Julie Jager
PATENT CENTER #	62563273	FILING DATE	06/23/2023
CUSTOMER #	89411	FIRST NAMED INVENTOR	Mr. Jeffrey R. Ambroziak
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Carson Fincham

Documents

TOTAL DOCUMENTS: 89

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
CF01-001-02-07_Transmittal-Letter.pdf	1	Transmittal Letter	494 KB
CF01-001-02-07-A-Foreign-001-FOR.pdf	11	Foreign Reference	1088 KB
CF01-001-02-07_PTO_IDS-Form-A.pdf	13	Information Disclosure Statement (IDS) Form (SB08)	1021 KB
CF01-001-02-07_PTO_IDS-Form-B.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	1019 KB
CF01-001-02-07-A-Foreign-003-FOR.pdf	17	Foreign Reference	1600 KB

CF01-001-02-07-A-Foreign-002-FOR.pdf	21	Foreign Reference	2000 KB
CF01-001-02-07-A-Foreign-004-FOR.pdf	19	Foreign Reference	1842 KB
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Digest

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CF01-001-02-07-A-NPL-025-Other.pdf	93305CE587954F9E28544BA70987DF53B417ECFB110FE7713410682D8F00DC763B32A50B53A80CE33D467BC5C3B2010986C382FD80CBB62F86AA3F3F02DAF662
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CF01-001-02-07-A-NPL-026-Other-pages-1073-1200.pdf	9218FE6A2400A146A706B68B401211A307D44E5CD6563B4740D855A84AE2BAD6F66F1FB77FB1D0D0B39AF8B5997194460805DBF9F6AA30AC321314593DF9E7A6
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CF01-001-02-07-A-NPL-026-Other-pages-0269-0536.pdf	21734FD5D56D5660CE827F19A2C558DA20AA51AACCBEB5D362704BB6CCE08A91C0E6456964F9AB52D78715A576B488F09E568C6A07C8A9952E375931416FA78C
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CF01-001-02-07-B-NPL-006.pdf	CB2543BD1F03372DD4480BC22EA97DA4424BDBAF6050CD13

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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/340,781	06/23/2023	Jeffrey R. Ambroziak	CF01-001-02-07	8229

89411 7590 08/22/2023

RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

EXAMINER	

ART UNIT	PAPER NUMBER
3649	

NOTIFICATION DATE	DELIVERY MODE
08/22/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ePAIR@rowantreelaw.com

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 18/340,781	**Applicant(s)** Ambroziak et al.	
	Examiner CHERYL P GIBSON BAYLOR	**Art Unit** OPET	**AIA (FITF) Status** No

1. THE REQUEST FILED 23 June 2023 IS **GRANTED** .

   The above-identified application has met the requirements for prioritized examination
   - A. ☑ for an original nonprovisional application (Track I).
   - B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination**. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:
   - A. filing a **petition for extension of time** to extend the time period for filing a reply;
   - B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims** , or a multiple dependent claim;
   - C. filing a **request for continued examination** ;
   - D. filing a notice of appeal;
   - E. filing a request for suspension of action;
   - F. mailing of a notice of allowance;
   - G. mailing of a final Office action;
   - H. completion of examination as defined in 37 CFR 41.102; or
   - I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to CHERYL GIBSON BAYLOR at (571)272-3213. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/CHERYL GIBSON BAYLOR/ Paralegal Specialist, OPET	

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
18/340,781	06/23/2023	Jeffrey R. Ambroziak	CF01-001-02-07

CONFIRMATION NO. 8229

89411
RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

PUBLICATION NOTICE

OC000000064060281

Date Mailed: 11/02/2023

Title:SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

Publication No.US-2023-0352963-A1
Publication Date:11/02/2023

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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NOTICE OF ALLOWANCE AND FEE(S) DUE

89411 7590 01/24/2024

RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

EXAMINER
BORISSOV, IGOR N

ART UNIT	PAPER NUMBER
3649	

DATE MAILED: 01/24/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/340,781	06/23/2023	Jeffrey R. Ambroziak	CF01-001-02-07	8229

TITLE OF INVENTION: SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	04/24/2024

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

89411 7590 01/24/2024
RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/340,781	06/23/2023	Jeffrey R. Ambroziak	CF01-001-02-07	8229

TITLE OF INVENTION: SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	04/24/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
BORISSOV, IGOR N	3649	705-007360

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via the USPTO patent electronic filing system ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/340,781	06/23/2023	Jeffrey R. Ambroziak	CF01-001-02-07	8229

89411 7590 01/24/2024

RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

EXAMINER	
BORISSOV, IGOR N	

ART UNIT	PAPER NUMBER
3649	

DATE MAILED: 01/24/2024

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).
https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
2) a federal, state, local, or international agency, in response to its request;
3) a contractor of the USPTO having need for the information in order to perform a contract;
4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c));
9) the Office of Personnel Management (OPM) for personnel research purposes; and
10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 18/340,781	Applicant(s) Ambroziak et al.	
	Examiner IGOR N BORISSOV	Art Unit 3649	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 8/22/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-17 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 08/04/2023; 08/04/2023.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/IGOR N BORISSOV/
Primary Examiner, Art Unit 3649

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Status of the Application

The current application filed 06/23/2023 is a continuation of 17/826,229, filed 05/27/2022

17/826,229 is a continuation of 17/306,776, filed 05/03/2021

17/306,776 is a continuation of 17/012,325, filed 09/04/2020, now U.S. Patent 10998753

17/012,325 is a continuation of 15/848,017, filed 12/20/2017, now U.S. Patent 10819135

15/848,017 is a continuation of 12/502,041, filed 07/13/2009, now U.S. Patent 9853488

12/502,041 Claims Priority from Provisional Application 61/134,646, filed 07/11/2008, now U.S. Patent 9,853,488

Claims 1-17 have been examined in this application. This communication is the first action on the merits.

Information Disclosure Statement

The information disclosure statements (IDS) submitted on 08/04/2023 are being considered by the examiner. The submission is in compliance with the provisions of 37 CFR 1.97.

Allowable Subject Matter

Claims 1-17 are allowed.

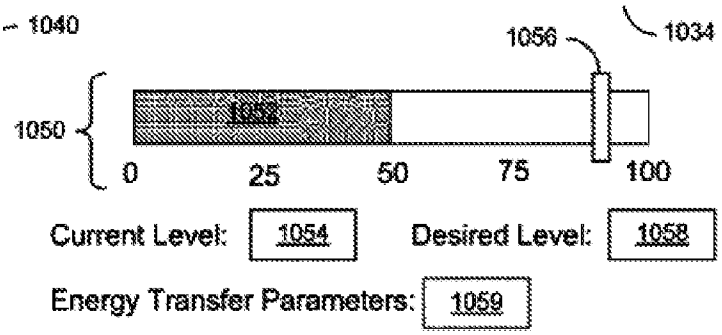
The following is an examiner's statement of reasons for allowance:

As per independent claims 1, 6 and 11 the best prior art of record, *Hafner et al.* US 2009/0313174 A1, *Pryor* US 7,402,978; *Pollack et al.* US 2008/0039989 A1, and *Straubel* US 2009/0139781 A1, neither anticipates, nor, alone or combined, renders obvious as a whole, the specific combination of the inventive features as currently recited in the independent claims.

Search and Prior Art

A comprehensive search of prior art has been conducted. The following references not relied upon is considered pertinent to applicant's disclosure have been uncovered during the search:

Failing - US 2011/0302078 A1 – discloses a method, computer-readable medium, and system for managing a transfer of energy for charging a vehicle, utilizing a GUI including a slider. In use, slider 1056 may be moved (e.g., to the left, to the right, etc.) to specify a capacity level measured in percent, a unit of energy, etc.Fig. 10. [0248]; [0249]; [0251]



Eberhard et al. - US 2009/0143929 A1 – discloses a method and apparatus that allows the end user to optimize the performance of an all-electric or hybrid vehicle and its charging system for a desired mode of operation, utilizing slide switches and displays 500 and 600 to select charging modes. Figs. 5 and 6; [0053]

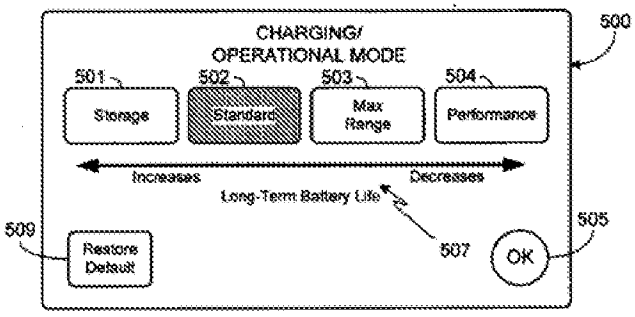


FIG. 5

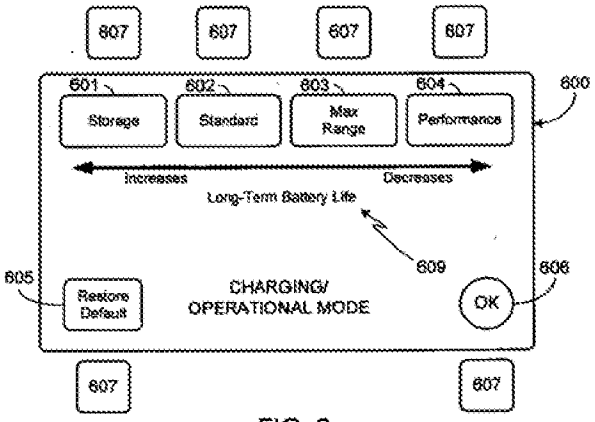


FIG. 6

MIFTAKHOV et al. - US 2016/0236585 A1 – discloses a system for charging an electric or hybrid-electric vehicle utilizing a GUI provided on a user device, wherein the user can interact with sliding widgets to optimize vehicle charging. Fig. 4; [0054]

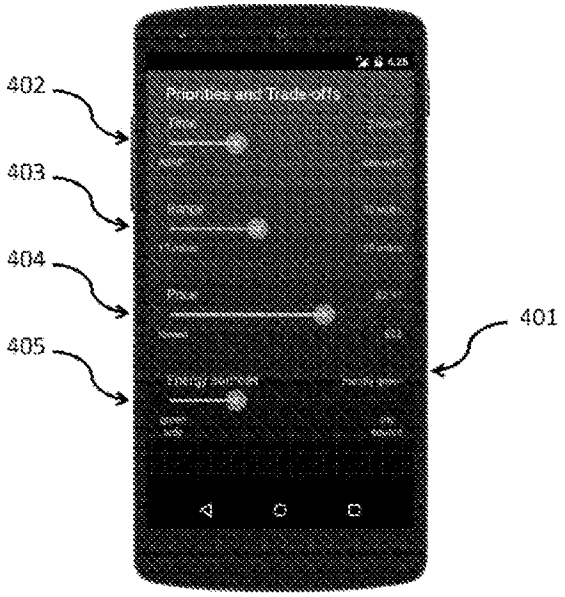


Figure 4

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submission should be clearly labeled “Comments on Statement of Reason for Allowance”.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Igor Borissov whose telephone number is 571-272-6801. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOSHUA MICHENER can be reached on 571-272-1467

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/IGOR N BORISSOV/
Primary Examiner, Art Unit 3649
01/18/2024

Notice of References Cited	Application/Control No. 18/340,781	Applicant(s)/Patent Under Reexamination Ambroziak et al.	
	Examiner IGOR N BORISSOV	Art Unit 3649	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Name	CPC Classification	US Classification
*	A	US-20110302078-A1	2011-12-08	Failing; Bryan Marc	B60L53/126	700/297
*	B	US-20090143929-A1	2009-06-04	Eberhard; Martin Forest	B60L3/0046	903/907
*	C	US-20160236585-A1	2016-08-18	MIFTAKHOV; VALERY	B60L53/665	1/1
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in YYYY-MM-DD format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/340,781	Ambroziak et al.
	Examiner	Art Unit
	IGOR N BORISSOV	3649

CPC - Searched*		
Symbol	**Date**	**Examiner**
H02J7/1446 B60L55/00 B60L53/126 B60L55/00 B60L53/126	01/16/2024	IB
B60L53/64 B60L53/14 B60L53/305 B60L53/665 B60L53/65	01/16/2024	IB
B60L3/12 B60L8/003 G06Q30/0283 G06Q30/04 G06Q50/06	01/16/2024	IB
B60L2240/72 Y02T10/72 Y02T90/167 B60L2260/54 B60L2250/16	01/16/2024	IB

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
705	7.36	01/16/2024	IB

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Key terms search	01/16/2024	IB
Classification search in combination with key terms	01/16/2024	IB
Inventor's name search	01/16/2024	IB
Backward or Forward search for pertinent references	01/16/2024	IB
Search has been conducted in US and Foreign databases	01/16/2024	IB

/IGOR N BORISSOV/ Primary Examiner, Art Unit 3649	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/340,781	Ambroziak et al.
	Examiner	Art Unit
	IGOR N BORISSOV	3649

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
705/H02J7	7.36/7/1446	01/16/2024	IB

/IGOR N BORISSOV/ Primary Examiner, Art Unit 3649	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/340,781	Ambroziak et al.
	Examiner	**Art Unit**
	IGOR N BORISSOV	3649

CPC					
Symbol				**Type**	**Version**
H02J	/	7	1446	F	2013-01-01
B60L	/	3	12	I	2013-01-01
B60L	/	8	003	I	2013-01-01
G06Q	/	30	0283	I	2013-01-01
G06Q	/	30	04	I	2013-01-01
G06Q	/	50	06	I	2013-01-01
B60L	/	53	64	I	2019-02-01
B60L	/	53	14	I	2019-02-01
B60L	/	53	65	I	2019-02-01
B60L	/	53	665	I	2019-02-01
B60L	/	55	00	I	2019-02-01
B60L	/	53	305	I	2019-02-01
B60L	/	53	126	I	2019-02-01
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B60L	/	2260	52	A	2013-01-01
B60L	/	2260	54	A	2013-01-01
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Y02T	/	10	92	A	2013-01-01
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B60L	/	2200	26	A	2013-01-01
Y04S	/	10	126	A	2013-01-01
Y04S	/	30	14	A	2013-01-01
Y04S	/	50	12	A	2013-01-01
Y04S	/	50	14	A	2013-01-01
Y02E	/	60	00	A	2013-01-01
Y02T	/	10	70	A	2013-01-01

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	17	
/IGOR N BORISSOV/ Primary Examiner, Art Unit 3649	17 January 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	11	7

U.S. Patent and Trademark Office

Part of Paper No.: 20240117

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/340,781	Ambroziak et al.
	Examiner	**Art Unit**
	IGOR N BORISSOV	3649

CPC							
Symbol						**Type**	**Version**
Y02T	/	10	/	72		A	2013-01-01
Y02T	/	10	/	7072		A	2013-01-01
Y02T	/	90	/	12		A	2013-01-01
Y02T	/	90	/	16		A	2013-01-01
Y02T	/	90	/	167		A	2013-01-01

CPC Combination Sets								
Symbol						**Type**	**Set**	**Ranking**	**Version**
	/		/						

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	17	
/IGOR N BORISSOV/ Primary Examiner, Art Unit 3649	17 January 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	11	7

U.S. Patent and Trademark Office

Part of Paper No.: 20240117

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/340,781	Ambroziak et al.
	Examiner	**Art Unit**
	IGOR N BORISSOV	3649

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H02J	/	7	/	14

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
705	7.36

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	17	
/IGOR N BORISSOV/ Primary Examiner, Art Unit 3649	17 January 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	11	7

U.S. Patent and Trademark Office

Part of Paper No.: 20240117

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/340,781	Ambroziak et al.
	Examiner	**Art Unit**
	IGOR N BORISSOV	3649

☑ Claims renumbered in the same order as presented by applicant ☑ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	10	10												
2	2	11	11												
3	3	12	12												
4	4	13	13												
5	5	14	14												
6	6	15	15												
7	7	16	16												
8	8	17	17												
9	9														

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	17	
/IGOR N BORISSOV/ Primary Examiner, Art Unit 3649	17 January 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	11	7

U.S. Patent and Trademark Office

Part of Paper No.: 20240117

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	18340781
Filing Date	2023-06-23
First Named Inventor	Jeffrey R. Ambroziak
Art Unit	3649
Examiner Name	TBD
Attorney Docket Number	CF01-001-02-07

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

Receipt date: 08/04/2023

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	18340781
	Filing Date	2023-06-23
	First Named Inventor	Jeffrey R. Ambroziak
	Art Unit	3649
	Examiner Name	TBD
	Attorney Docket Number	CF01-001-02-07

	1	Office Action dated August 5, 2022 for US App. No. 17/829,412 (pages1-4)	☐
	2	Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated August 12, 2013; 15 pps.	☐
	3	Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated December 15,2011; 9 pps.	☐
	4	Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated January 7, 2013; 17 pps.	☐
	5	Office Action for Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated January 17, 2020; 21 pps.	☐
	6	Website: The Tesla Roadster (first generation) Drive Zero Car Guide—Drive Zero “https://www.drivezero.com.au/cars/tesla/tesla-car-guides/tesla-roadster-1-guide/” download date Oct. 21, 2019; 21 pps.	☐
	7	Wikipedia (R) download for article title “Better Place”, http://en.wikipedia.org/wiki/Better_Place, dated Dec. 12, 2013; 14 pps.	☐

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EXAMINER SIGNATURE

Examiner Signature	/IGOR N BORISSOV/ (01/16/2024)	Date Considered	01/16/2024

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /I.N.B/

Receipt date: 08/04/2023

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(**Not for submission under 37 CFR 1.99)**

Application Number	18340781
Filing Date	2023-06-23
First Named Inventor	Jeffrey R. Ambroziak
Art Unit	3649
Examiner Name	TBD
Attorney Docket Number	CF01-001-02-07

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Carson C.K. Fincham, Reg. No. 54,096/	Date (YYYY-MM-DD)	2023-08-04
Name/Print	Carson C.K. Fincham	Registration Number	54096

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Bibliographic Data

Application No: 18/340,781

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /IGOR N BORISSOV/ Examiner's Signature | Initials

Title: SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
06/23/2023	705	3649	CF01-001-02-07
RULE			

APPLICANTS

Charge Fusion Technologies, LLC, Ridgefield, CT, UNITED STATES

INVENTORS

Mr. Jeffrey R. Ambroziak, Guilford, CT, UNITED STATES

Mr. Carson C.K. Fincham, Ridgefield, CT, UNITED STATES

CONTINUING DATA

This application is a CON of 17826229 05/27/2022

17826229 is a CON of 17306776 05/03/2021 PAT 11631987

17306776 is a CON of 17012325 09/04/2020 PAT 10998753

17012325 is a CON of 15848017 12/20/2017 PAT 10819135

15848017 is a CON of 12502041 07/13/2009 PAT 9853488

12502041 has PRO of 61134646 07/11/2008

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

07/25/2023

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UNITED STATES

ADDRESS

RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877
UNITED STATES

FILING FEE RECEIVED

$2,400

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	4	("10998753" "10819135" "9853488" "20210273478").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:04 PM
L2	1571	705/7.36.ccls.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:06 PM
L3	2381	(H02J7/1446).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:07 PM
L5	14134	(B60L55/00 OR B60L53/126).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:09 PM
L7	6280	(B60L55/00).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:10 PM
L8	8585	(B60L53/126)cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:10 PM
L9	14442	7 OR 8	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:10 PM
L12	3936	(B60L53/64).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:11 PM
L13	19347	(B60L53/14).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:11 PM
L14	10332	(B60L53/305).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:13 PM
L15	6737	(B60L53/665).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:13 PM
L16	11873	(B60L53/65).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:14 PM
L17	10967	(B60L3/12).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:14 PM
L18	3544	(B60L8/003).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:14 PM
L19	15902	(G06Q30/0283).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:15 PM
L20	26377	(G06Q30/04).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO;	OR	ON	ON	2022/07/19 06:15 PM

			IBM_TDB)				
L21	35036	(G06Q50/06).cpc,cpci,cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:15 PM
L22	127348	2 OR 3 OR 5 OR 7 OR 8 OR 9 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:18 PM
L23	21	("4347472" | "5710502" | "5790976" | "5892346" | "6618650" | "6727708" | "7358701" | "7402978" | "7698078" | "7778746" | "20030152088" | "20040010358" | "20080039989" | "20080162305" | "20090001927" | "20090021385" | "20090130965" | "20090139781" | "20090189807" | "20090313174" | "20110148356").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/19 06:25 PM
L24	13	("4347472" | "5710502" | "6618650" | "7358701" | "7402978" | "7761203" | "7778746" | "20030152088" | "20040010358" | "20080039989" | "20090021385" | "20090139781" | "20090313174").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/19 06:26 PM
L25	2	("9853488" "20210273478").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:27 PM
L26	2	("9853488" "20210273478").pn. AND (associated WITH building)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:28 PM
L27	2	("9853488" "20210273478").pn. AND (solar WITH panel$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:30 PM
L28	10056	((hood near2 mounted) OR (hood near2 integrated) OR (roof near2 (mounted OR integrated)) WITH (solar near2 panel$1))	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:33 PM

L29	21	((hood near2 mounted) OR (hood near2 integrated)) WITH (solar near2 panel$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:34 PM
L30	8767	((hood near2 mounted) OR (hood near2 integrated) OR (roof near2 (mounted OR integrated)) WITH (solar near2 panel$1) WITH vehicle$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:35 PM
L31	0	("9853488" "20210273478").pn. AND (solar WITH panel$1 WITH proximity WITH building)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:38 PM
L32	2	("9853488" "20210273478").pn. AND (solar WITH panel$1 WITH building)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:38 PM
L33	0	("9853488" "20210273478").pn. AND (flush WITH horizontal)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:40 PM
L34	2	("9853488" "20210273478").pn. AND (flush OR horizontal)	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:40 PM
L35	24	transmitter$1 WITH (embedded OR installed OR mounted) WITH flush WITH (pavement OR floor)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:43 PM
L36	7	35 AND (wireless$3 WITH charg$3)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:43 PM
L37	7	22 AND 36	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:44 PM
L38	2	22 AND (35 NOT 36)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO;	OR	ON	ON	2022/07/19 06:46 PM

			IBM_TDB)				
L39	4214	transmitter$1 WITH (embedded OR installed OR mounted) WITH (pavement OR floor)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:47 PM
L40	560	39 AND (wireless$3 WITH charg$3) AND (charg$3 WITH (battery OR vehicle$1 OR car$1))	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:49 PM
L41	31	(40 NOT 35) AND 22	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:50 PM
L42	23	("10011182"|"11146092"|"11164262"|"20090046538"|"20120206098"|"20140240143"|"20160059733"|"20160176265"|"20170066334"|"20170120757"|"20170140603"|"20170179766"|"20170197548"|"20170213165"|"20180025604"|"20180056784"|"20180059913"|"20180126872"|"20190265868"|"20190296589"|"20210291730"|"20210339708"|"9379571").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:53 PM
L43	1	"7164117".PN.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 06:56 PM
L44	1	43 AND (wireless$3 WITH (charg$3 OR transmitter)) AND (floor OR pavement)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/19 06:57 PM
L45	13	("20150001967"|"9024578"|"9722447"|"20070024293"|"20120242163"|"9575108"|"20090284245"|"7002262"|"20090284245"|"20140266018"|"20090046538"|"20130033228"|"20130278211	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 07:07 PM

		"|"4634969").PN.					
L46	7	("4800328"|"4656412"|"8466654"|"20130285603"|"6184651"|"7880337"|"5654621").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/19 07:14 PM
L47	16	("3914562" | "4331225" | "4800328" | "4836344" | "5207304" | "5464082" | "5559420" | "5573090" | "5621654" | "5669470" | "5696695" | "5968680" | "6412604" | "6803744" | "20040145342" | "20080224670").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/19 07:16 PM
L48	35	("Re29994" | "2589453" | "3673379" | "3914562" | "3938018" | "4007817" | "4031449" | "4158802" | "4218624" | "4218889" | "4236594" | "4254843" | "4331225" | "4347472" | "4350287" | "4484083" | "4495836" | "4583505" | "4588040" | "4629947" | "4742283" | "4800328" | "4836344" | "4893240" | "5000139" | "5049802" | "5055851" | "5113427" | "5129376" | "5198811" | "5207304" | "5244054" | "5293308" | "5311973").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/19 07:20 PM
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L50	3	("4800328" "5669470" "7880337" "4800328").pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/19 07:26 PM
L51	1	"20100017249".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/28 03:19 PM
L52	1	("10998753").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/28 03:21 PM
L53	1	"10819135".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/28 03:21 PM
L54	1	"9853488" .pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/28 03:22 PM
L55	13	("4347472" | "5710502" | "6618650" | "7358701" | "7402978" | "7761203" | "7778746" | "20030152088" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 03:23 PM

		"20040010358" | "20080039989" | "20090021385" | "20090139781" | "20090313174").pn. AND (PGPB | USPT | USOC).dbnm.					
L56	1929	tesla WITH motors	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 03:26 PM
L57	579	tesla ADJ motors.AS.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 03:30 PM
L58	1015	tesla ADJ motors	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 03:31 PM
L59	173	("7402978").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 03:50 PM
L60	25	minimum WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification) WITH (mobile OR (smart ADJ phone))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:29 PM
L61	0	57 AND 60	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:30 PM
L62	0	(57 OR 56 OR 58) AND 60	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:30 PM
L63	0	22 AND 60	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:30 PM
L64	184	minimum WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:32 PM
L65	111	(minimum WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)) AND (mobile OR (smart ADJ phone))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:32 PM
L66	0	(57 OR 56 OR 58) AND (65 NOT 60)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:32 PM
L67	90	(minimum WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)) AND (mobile OR (smart ADJ phone)) AND (charg$3 WITH ((electric near3 vehicle$1) OR battery))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:34 PM
L68	172214	(alert$3 OR alarm$3	(US-PGPUB; USPAT;	OR	ON	ON	2022/07/28

		OR notif$4 OR notification) WITH (mobile OR (smart ADJ phone))	USOCR)				04:34 PM
L69	50	67 AND 68	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:34 PM
L70	0	69 AND tesla	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:35 PM
L71	40	67 NOT 69	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:36 PM
L72	40	71 AND (alert$3 OR alarm$3 OR notif$4 OR notification) AND (mobile OR (smart ADJ phone))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:37 PM
L73	21	(65 NOT 67) AND (mobile OR (smart ADJ phone))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:40 PM
L74	0	1 AND (minimum WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)) AND (mobile OR (smart ADJ phone)) AND (charg$3 WITH ((electric near3 vehicle$1) OR battery))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:41 PM
L75	4	1 AND (charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:42 PM
L76	758	(predetermined OR desired) WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:45 PM
L77	59	(predetermined OR desired) WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification) WITH (mobile OR cellular OR (smart ADJ phone))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:47 PM
L78	1	77 AND "6323775".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 04:57 PM
L79	362	((predetermined OR desired) WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)) AND (mobile OR cellular OR	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:00 PM

		(smart ADJ phone)) AND (charg$3 WITH (electric near3 vehicle) OR battery)					
L80	57	((predetermined OR desired) WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)) WITH (mobile OR cellular OR (smart ADJ phone)) AND (charg$3 WITH (electric near3 vehicle) OR battery)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:01 PM
L81	1	80 AND "8676273".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:07 PM
L82	0	((predetermined OR desired) WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification)) AND 57	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:10 PM
L83	35	57 AND (alert$3 OR alarm$3 OR notif$4 OR notification) AND (charg$3 WITH level)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:12 PM
L84	7	(mobile OR cellular OR (smart ADJ phone)) AND 83	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:12 PM
L85	1	84 AND "20090021385".pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:14 PM
L86	703	(solar WITH panel$1 WITH vehicle WITH (hood OR roof)) AND (electric WITH vehicle$1)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:19 PM
L87	3823	charg$3 WITH second WITH (electric near3 vehicle$1) WITH first	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:45 PM
L88	222047	charg$3 WITH second WITH (electric near3 vehicle$1) WITH first (electric near3 vehicle$1)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:45 PM
L90	1734	22 AND (charg$3 WITH second WITH (electric near3 vehicle$1) WITH first WITH (electric near3 vehicle$1))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:46 PM
L91	84	22 AND (park$3 WITH charg$3 WITH second WITH (electric near3 vehicle$1) WITH first	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:46 PM

		WITH (electric near3 vehicle$1))					
L92	1650	90 NOT 91	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:49 PM
L93	245	transmitting WITH charge WITH second WITH vehicle	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:50 PM
L94	45	92 AND 93	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:50 PM
L95	200	93 NOT 94	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:52 PM
L96	93	95 AND (connect$3 WITH second WITH vehicle)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 05:53 PM
L97	13	("20160129793"|"7246774"|"20170136881"|"20140306063"|"9566868"|"20020096412"|"20100121509"|"7275718"|"8368348"|"20160303986"|"9407105"|"20170225682"|"20150336677").PN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:08 PM
L98	26	("4617506" | "5202617" | "5323099" | "5548200" | "5573090" | "5963013" | "6339736" | "6826460" | "6963186" | "7602143" | "7619319" | "8384358" | "20090082957" | "20090114463" | "20090192660" | "20090312903" | "20100049737" | "20100065344" | "20100071979" | "20100289451" | "20110025267" | "20110055037" | "20110191186" | "20110251935" | "20110295444" | "20130221918").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:10 PM
L99	16	("4617506").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:27 PM
L100	16	("3466453" | "4079304" | "4157492" | "4277692" | "4366430" | "4617506" | "4726786" | "4885524" | "5697810" | "5766020" | "5936381" | "5965998" | "7145788" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:33 PM

		"20040062059" | "20040145340").pn. AND (PGPB | USPT | USOC).dbnm.					
L101	2930	charg$3 WITH (preference$1 OR instruction$1) WITH (mobile OR cellular OR (hand ADJ held) OR (smart ADJ phone) OR smart$1phone)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:43 PM
L102	376	101 AND (charg$3 WITH (electric near3 vehicle$1))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:44 PM
L103	521	charg$3 WITH (preference$1 OR instruction$1) WITH ((minimum OR predetermined) WITH level)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:45 PM
L104	24	102 AND 103	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:45 PM
L105	352	102 NOT 104	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:48 PM
L106	0	"20040010358".pn. AND charg$3 AND (schedul$3 OR preference$1) AND mobile	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:53 PM
L107	1	"20040010358".pn. AND (schedul$3 OR preference$1) AND mobile	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/07/28 06:53 PM
L108	7	("4800328" "5669470" "7880337").pn.	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/07/29 06:06 PM
L109	3	("4800328" "5669470" "7880337").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/29 06:06 PM
L110	1	("4800328" "5669470" "7880337").pn. AND sensor AND parking	(US-PGPUB; USPAT)	OR	ON	ON	2022/07/29 06:07 PM
L111	0	"20090189807".pn. AND temperature AND park$3 AND pet$1	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:29 PM
L112	1	"20090189807".pn. AND (temperature OR	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA,	OR	ON	ON	2022/08/01 01:29 PM

		park$3 OR pet$1)	CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)				
L113	3	"20090130965".pn. AND (temperature OR park$3 OR pet$1)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:32 PM
L114	22	(cost WITH (charg$3 near3 level) WITH preference$1 WITH charging)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:48 PM
L115	0	((smart ADJ phone) OR smart$1phone OR mobile OR (hand ADJ held)) WITH (cost WITH (charg$3 near3 level) WITH preference$1 WITH charging)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:49 PM
L116	0	((smart ADJ phone) OR smart$1phone OR mobile OR (hand ADJ held)) SAME (cost WITH (charg$3 near3 level) WITH preference$1 WITH charging)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:50 PM
L117	20	((smart ADJ phone) OR smart$1phone OR mobile OR (hand ADJ held)) AND (cost WITH (charg$3 near3 level) WITH preference$1 WITH charging)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:50 PM
L118	13	117 AND 22	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:50 PM
L119	7	117 NOT 118	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:51 PM
L120	2	114 NOT 117	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/08/01 01:52 PM
L121	1	"7402978" .pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 06:51 PM
L122	1	"7402978" .pn. AND ((common WITH outlet) OR building)	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 06:56 PM
L123	1	"7949435".pn. AND	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24

		((common WITH outlet) OR building)					06:58 PM
L124	1	"7949435".pn. AND (grid WITH residence$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 07:00 PM
L125	1	"7949435".pn. AND (grid WITH residence$1) AND (wall WITH receptacle) AND (wall WITH outlet)	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 07:01 PM
L126	1	"5,642,270".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 07:18 PM
L127	82	((wall near3 mount$3) WITH ((charg$3 near3 device) OR charger)) AND (electric WITH vehicle$1) AND (charg$3 WITH batter$3)	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 09:03 PM
L128	43	127 AND grid	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 09:03 PM
L129	14	127 AND ((back OR sell$3 OR return$3) WITH grid)	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 09:04 PM
L130	1	"8299754".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/24 09:10 PM
L131	15	("5202617" | "5803215" | "5847537" | "6232743" | "6371230" | "6614204" | "7256516" | "7259664" | "20060028178" | "20060060236" | "20090079389" | "20090082957" | "20090313174" | "20100145717" | "20100161482").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 09:11 PM
L132	1	"5202617".pn. AND 131	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 09:22 PM
L133	1	"5803215".pn. AND 131	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 09:24 PM
L134	1	"20060028178".pn. AND 131	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 09:27 PM
L135	1	"7256516".pn. AND 131	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 09:28 PM
L136	1	"20090082957".pn. AND 131 AND distance	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 09:28 PM
L137	1	"20090313174".pn. AND 131	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 09:30 PM
L138	1	"5,790,976".pn. AND distanc$3	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/08/24 11:57 PM

L139	10	("20040010358"|"20090021385"|"20110089887"|"4617506"|"4800328"|"5669470"|"7402978"|"7443049"|"7880337"|"7949435").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/25 12:21 AM
L140	2	("20040010358"|"20090021385"|"20110089887"|"4617506"|"4800328"|"5669470"|"7402978"|"7443049"|"7880337"|"7949435").PN. AND (charging WITH station$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/25 12:21 AM
L141	6	"2,589,453"	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/25 12:39 AM
L142	1	"2,589,453".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/08/25 12:40 AM
L143	48	("7402978"|"7443049"|"7880337"|"20090130965"|"7358701"|"7778746"|"7827120"|"4800328"|"20080243331"|"7671567"|"7683570"|"7849944"|"7956570"|"20110148356"|"5892346"|"7055340"|"7761203"|"5669470"|"4347472"|"6618650"|"6727708"|"7782021"|"4617506"|"20080162305"|"20090189807"|"20090313034"|"5790976"|"7698078"|"7949435"|"20090089254"|"20090139781"|"5623194"|"20040010358"|"20090021385"|"20080039989"|"20080275848"|"20090313174"|"5487002"|"5710502"|"8531162"|"20110089887"|"20030152088"|"20080040223"|"20090001927"|"20090030712"|"6421600"|"6586940"|"8198856").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:19 PM
L144	44	(solar wtih vehicle$1) AND ("7402978"|"7443049"|"7880337"|"20090130965"|"7358701"|"7778746"|"7827120"|"4800328"|"20080243331"|"7671567"|"7683570"|"7849944"|"7956570"|"20110148356"|"5892346"|"7055340"|"7761203"|"5669470"	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:21 PM

		|"4347472"|"6618650"|"6727708"|"7782021"|"4617506"|"20080162305"|"20090189807"|"20090313034"|"5790976"|"7698078"|"7949435"|"20090089254"|"20090139781"|"5623194"|"20040010358"|"20090021385"|"20080039989"|"20080275848"|"20090313174"|"5487002"|"5710502"|"8531162"|"20110089887"|"20030152088"|"20080040223"|"20090001927"|"20090030712"|"6421600"|"6586940"|"8198856").PN.					
L145	30	(solar wtih panel$1) AND (143 OR 144)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:22 PM
L146	1	"20110089887".pn. AND (cost$1 OR price$1 OR rate$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:41 PM
L147	44	(solar wtih vehicle$1) AND 143	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:42 PM
L148	5	147 AND appliance$1	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:43 PM
L149	0	"20090139781".pn. AND appliance$1 AND solar	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:47 PM
L150	1	"20090139781".pn. AND appliance$1	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:47 PM
L151	40	143 AND (cost$1 OR price$1 OR rate$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:53 PM
L152	15	143 AND (cost$1 OR price$1 OR rate$1) AND solar	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 04:57 PM
L153	1	"4617508".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 06:17 PM
L154	0	153 AND (cost$1 OR price$1 OR rate$1) AND solar	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 06:17 PM
L155	1	153 AND (cost$1 OR price$1 OR rate$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 06:18 PM
L156	0	"7443049".pn. AND (cost$1 OR price$1 OR rate$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 06:20 PM
L157	1	"7443049".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 06:20 PM
L158	1	"7443049".pn. AND (home OR building OR house)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 06:35 PM
L159	1	"7443049".pn. AND	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12

		(home OR building OR house OR grid)					06:35 PM
L160	39	(Artificial Intelligence) More like doc: US-7443049-B1 Text: (CN-103370838-B OR WO-2014032851-A2 OR EP-2677607-B1 OR US-9160184-B2 OR DE-102012215331-A1 OR US-9193274-B2 OR US-20130314034-A1 OR JP-5601385-B2 OR CN-112753150-A OR EP-2677607-A1 OR CN-111823896-A OR EP-2473370-B1 OR US-20120286720-A1 OR DE-102009029091-A1 OR WO-2011026721-A2 OR EP-2473370-A2 OR US-9193272-B2 OR AU-2005254520-A1 OR US-20210291670-A1 OR EP-3788699-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/12 06:42 PM
L161	16	("3466453" | "4079304" | "4157492" | "4277692" | "4366430" | "4617506" | "4726786" | "4885524" | "5697810" | "5766020" | "5936381" | "5965998" | "7145788" | "20040062059" | "20040145340").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/12 06:56 PM
L162	1	143 AND "4617506".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 07:16 PM
L163	35	("0691144" | "1786280" | "2392737" | "3281816" | "3466453" | "3654538" | "3746961" | "3857082" | "4020414" | "4027231" | "4163186" | "4217533" | "4238722" | "4355275").pn. OR ("4617506").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/12 07:16 PM
L164	6	("4308493" | "5872453" | "5939864" | "6011380" | "6188202" | "6904342").pn. AND	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/12 10:35 PM

		(PGPB | USPT | USOC).dbnm.					
L165	0	164 AND (alarm OR alert)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/12 10:38 PM
L166	1	"20080312782".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 10:41 PM
L167	1	"20080312782".pn. AND ((cell ADJ phone) OR pda OR email) AND (state near3 charge) AND (problem near4 charging) AND (notifying OR notif$3 OR alert$3 OR alarm$3 OR notification$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 10:49 PM
L168	0	"20080312782".pn. AND solar	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/12 11:56 PM
L169	0	"7443049".pn. AND (alert OR alarm OR notification$1)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 12:20 AM
L170	1	("7443049" "20080312782" "7671567" "8531162").pn. AND slid$3	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 12:31 AM
L171	33	(Artificial Intelligence) More like doc: US-7671567-B2 Text: (US-20090140700-A1 OR US-20090167254-A1 OR US-7622897-B2 OR US-20090143929-A1 OR US-20090140698-A1 OR US-7629772-B2 OR US-7629773-B2 OR EP-2209177-A2 OR EP-2209177-B1 OR JP-2010165676-A OR JP-5055347-B2 OR US-8907629-B2 OR US-20130221916-A1 OR US-20130221928-A1 OR US-8970173-B2 OR US-7928699-B2 OR US-20100134073-A1 OR US-20100072954-A1 OR US-7755329-B2 OR US-20100138092-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/13 12:37 AM
L172	0	("7741816").pn. AND slid$3	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 12:40 AM
L173	1	("7741816").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 12:40 AM

L174	6	("4308493" | "5872453" | "5939864" | "6011380" | "6188202" | "6904342").pn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/13 12:43 AM
L175	5	("7443049" "20080312782" "7671567" "8531162" "20080039989").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 12:58 AM
L176	13	("7443049" "20080312782" "7671567" "8531162" "20080039989" "20110148356" "20110089887" "7880337" "7761203" "6421600" "5669470" "4800328" "4347472").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 01:15 AM
L177	1383	camping WITH electric WITH (car$1 OR vehicle$1)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:16 AM
L178	424	camping WITH electric WITH (car$1 OR vehicle$1) WITH appliance$1	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:17 AM
L179	78	camping WITH electric WITH (car$1 OR vehicle$1) WITH appliance$1 WITH (building$1 OR hous$3 OR cabin$1 OR shed OR bungalow OR cottage OR chalet OR lodge OR hut)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:19 AM
L180	3	camping WITH electric WITH (car$1 OR vehicle$1) WITH appliance$1 WITH (building$1 OR hous$3 OR cabin$1 OR shed OR bungalow OR cottage OR chalet OR lodge OR hut) WITH (provid$3 near2 (power OR energy))	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:20 AM
L181	27	camping WITH electric	(US-PGPUB; USPAT;	OR	ON	ON	2022/09/13

		WITH (car$1 OR vehicle$1) WITH appliance$1 WITH (building$1 OR hous$3 OR cabin$1 OR shed OR bungalow OR cottage OR chalet OR lodge OR hut) WITH (power$3 OR energy)	FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)				01:21 AM
L182	51	179 NOT 181	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:28 AM
L183	0	182 AND 22	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:28 AM
L184	1285	emergency WITH power WITH (electric near2 (car$1 OR vehicle$1)) WITH (building OR appliance$1 OR hospital OR cottage OR bungalow)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:31 AM
L185	359	emergency WITH power WITH (electric near2 (car$1 OR vehicle$1)) WITH (building OR hospital)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:31 AM
L186	34	emergency WITH (provid$3 near3 power) WITH (electric near2 (car$1 OR vehicle$1)) WITH (building OR hospital)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:32 AM
L187	1	186 AND RE39908	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:34 AM
L188	1	186 AND "5834922".pn.	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA,	OR	ON	ON	2022/09/13 01:36 AM

			EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)				
L189	325	185 NOT 186	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:37 AM
L190	1	189 AND "2008059846"	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 01:42 AM
L193	0	("7741816").pn. AND (alert$1 OR alarm$3)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:15 PM
L194	1	("7741816").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:16 PM
L195	1	175 AND ((alert$1 OR alarm$3) WITH battery)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:17 PM
L196	1	175 AND ((alert$1 OR alarm$3) WITH battery) AND ((cell ADJ phone) OR (smart ADJ phone) OR mobile OR pda)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:18 PM
L197	1	instruction$1 AND 175 AND ((alert$1 OR alarm$3) WITH battery) AND ((cell ADJ phone) OR (smart ADJ phone) OR mobile OR pda)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:32 PM
L198	3	instruction$1 AND 175	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:42 PM
L199	2	175 NOT 198	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:46 PM
L200	1	(175 NOT 198) AND solar	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:47 PM
L201	1	"7949435".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:49 PM
L202	1	"7402978".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 07:52 PM
L203	48	("7402978"|"7443049"|"7880337"|"20090130965"|"7358701"|"7778746"|"7827120"|"4800328"|"20080243331"|"7671567"|"7683570"|"7849944"|"7956570"|"20110148356"|"5892346"|"705534	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 08:35 PM

		0"|"7761203"|"5669470"|"4347472"|"6618650"|"6727708"|"7782021"|"4617506"|"20080162305"|"20090189807"|"20090313034"|"5790976"|"7698078"|"7949435"|"20090089254"|"20090139781"|"5623194"|"20040010358"|"20090021385"|"20080039989"|"20080275848"|"20090313174"|"5487002"|"5710502"|"8531162"|"20110089887"|"20030152088"|"20080040223"|"20090001927"|"20090030712"|"6421600"|"6586940"|"8198856").PN.					
L204	306	("5202617").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/13 08:45 PM
L205	1	"7949435".pn. AND (charging WITH station)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/09/13 08:58 PM
L206	3	"4617506".pn.	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/13 11:25 PM
L207	1	"4617506".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 11:25 PM
L208	5	("7443049" "20080312782" "7671567" "8531162" "20080039989" "7949435").pn. AND (cost$1 OR pric$3)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 11:50 PM
L209	2	("7,443,049" OR "7,949,435" OR "20080312782").pn. AND (cost$1 OR pric$3)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/13 11:54 PM
L210	1	("7,443,049" OR "7,949,435" OR "20080312782").pn. AND solar	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 12:04 AM
L211	1	"20110089887".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 12:19 AM
L212	3	("7,443,049" OR "7,949,435" OR "20080312782").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 06:23 PM
L213	2284	receiv$3 WITH	(US-PGPUB; USPAT;	OR	ON	ON	2022/09/14

		request$1 WITH charg$3 WITH second WITH vehicle	FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)				06:55 PM
L214	0	receiv$3 WITH request$1 WITH charg$3 WITH second WITH vehicle WITH (jump ADJ start)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2022/09/14 06:55 PM
L215	311	receiv$3 WITH request$1 WITH charg$3 WITH second WITH vehicle	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 06:55 PM
L216	1	203 AND 215	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 06:56 PM
L217	1	"7880337".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 07:27 PM
L218	1	"7880337".pn. AND (detect$3 OR determin$3)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 07:30 PM
L219	3	"2008059846"	(DERWENT)	OR	ON	ON	2022/09/14 07:55 PM
L220	0	"wo2008059846"	(DERWENT)	OR	ON	ON	2022/09/14 07:56 PM
L221	0	(WATANABE near1 SHOICHIRO) WITH (HONDA near1 KAZUYOSHI)	(DERWENT)	OR	ON	ON	2022/09/14 07:57 PM
L222	0	Nobuhiko AND (emergency WITH power WITH buildings WITH uninterruptable WITH power WITH supply)	(DERWENT)	OR	ON	ON	2022/09/14 07:59 PM
L223	0	Nobuhiko AND (emergency WITH power WITH buildings WITH uninterruptable WITH power WITH supply)	(US-PGPUB; USPAT; EPO; JPO; DERWENT)	OR	ON	ON	2022/09/14 07:59 PM
L224	13	(emergency WITH power WITH buildings WITH uninterruptable WITH power WITH supply)	(US-PGPUB; USPAT; EPO; JPO; DERWENT)	OR	ON	ON	2022/09/14 07:59 PM
L225	13	(emergency WITH power WITH buildings WITH uninterruptable WITH power WITH supply)	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 07:59 PM

L226	0	hybrid WITH vehicle WITH emergency WITH power WITH buildings WITH uninterruptable WITH power WITH supply	(US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 08:02 PM
L227	2	("7741816" "7782021").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 08:18 PM
L228	0	("7741816" "7782021").pn. AND slid$3	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 08:19 PM
L229	5	("7,443,049" "7,949,435" "20080312782" "7,880,337" "20110148356").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 05:52 PM
L230	6	("7,443,049" "7,949,435" "20080312782" "7,880,337" "20110148356" "20110089887").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 05:54 PM
L231	1	"7956570".pn. AND second	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 05:59 PM
L232	1	"20110148356".pn. AND second	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 06:00 PM
L233	1	"7956570".pn. AND second AND request$3 AND (charge near3 transfer$4)	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 06:01 PM
L234	1	"7956570".pn. AND second AND request$3 AND (charge near3 transfer$4) AND (lower WITH power WITH rates)	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 07:14 PM
L235	41	"5686812" "7741816"	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 07:57 PM
L236	3	("5686812" "7741816" "20090144622").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 07:57 PM
L237	48	("20030152088"|"20090021385"|"20090130965"|"20110148356"|"7827120"|"20040010358"|"7698078"|"20080243331"|"7671567"|"7683570"|"7849944"|"7956570"|"5710502"|"4617506"|"7055340"|"7761203"|"7880337"|"20090189807"|"6727708"|"7402978"|"5790976"|"4800328"|"5669470"|"7782021"|"20080039989"|"5790976"|	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 07:58 PM

		20090139781"|"200903 13174"|"20090313034"| "20110089887"|"66186 50"|"20090089254"|"56 23194"|"7949435"|"434 7472"|"7358701"|"2008 0275848"|"5487002"|"7 443049"|"8531162"|"20 080162305"|"20090001 927"|"20090139781"|"2 0090313174"|"5892346 "|"7778746"|"20080040 223"|"20090030712"|"6 421600"|"6586940"|"81 98856").PN.					
L238	0	236 AND 237	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 07:59 PM
L239	1	("5686812" "7741816" "20090144622").pn. AND (alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) AND (charg$3 WITH (instruction$1 OR command$1))	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:14 PM
L240	0	("5686812" "7741816" "20090144622").pn. AND (alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) AND (charg$3 WITH level)	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:16 PM
L241	49	("7402978"|"7443049"|" 7880337"|"2009013096 5"|"7358701"|"7778746" |"7827120"|"4800328"|" 20080243331"|"767156 7"|"7683570"|"7849944" |"7956570"|"201101483 56"|"5892346"|"705534 0"|"7761203"|"5669470" |"4347472"|"6618650"|" 6727708"|"7782021"|"4 617506"|"20080162305 "|"20090189807"|"2009 0313034"|"5790976"|"7 698078"|"7949435"|"20 090089254"|"20090139 781"|"5623194"|"20040 010358"|"20090021385 "|"20080039989"|"2008 0275848"|"2009031317 4"|"5487002"|"5710502" |"8531162"|"201100898 87"|"20030152088"|"20	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:17 PM

		080040223"|"20090001927"|"20090030712"|"6421600"|"6586940"|"8198856"|"20080312782").PN.					
L242	9	(237 OR 241) AND (alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) AND (charg$3 WITH (instruction$1 OR command$1))	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:18 PM
L243	6	((("CHARGE") near3 ("FUSION") near3 ("TECHNOLOGIES") near3 ("LLC"))).AS,AANM.	(USPAT)	OR	ON	ON	2023/03/31 08:19 PM
L244	56	((("AMBROZIAK") near3 ("Jeffrey")) OR (("FINCHAM") near3 ("Carson"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/03/31 08:21 PM
L246	5	242 NOT 243	(USPAT)	OR	ON	ON	2023/03/31 08:24 PM
L247	9	242 NOT 243	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:24 PM
L248	30	("5172044" | "5187424" | "5552953" | "5744937" | "6191559").pn. OR ("6586940").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/03/31 08:43 PM
L249	0	248 AND ((alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH ((minimum OR predetermined) WITH level)) AND (charg$3 WITH (instruction$1 OR command$1))	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:47 PM
L250	840	((alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH ((minimum OR predetermined) WITH charg$3 WITH level)) AND (charg$3 WITH (instruction$1 OR command$1))	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/31 08:48 PM
L251	63	22 AND ((alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP,	OR	ON	ON	2023/03/31 08:48 PM

		((minimum OR predetermined) WITH charg$3 WITH level)) AND (charg$3 WITH (instruction$1 OR command$1))	KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)				
L252	0	((transmit$4 OR transmission) WITH (charge OR power) WITH (biuilding OR house)) AND 22 AND ((alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH ((minimum OR predetermined) WITH charg$3 WITH level)) AND (charg$3 WITH (instruction$1 OR command$1))	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/31 08:50 PM
L253	5	((transmit$4 OR transmission) WITH (charge OR power) WITH (biuilding OR house)) AND ((alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH ((minimum OR predetermined) WITH charg$3 WITH level)) AND (charg$3 WITH (instruction$1 OR command$1))	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/03/31 08:50 PM
L254	0	248 AND (((transmit$4 OR transmission) WITH (charge OR power) WITH (biuilding OR house)) OR ((alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH ((minimum OR predetermined) WITH charg$3 WITH level))) AND (charg$3 WITH (instruction$1 OR command$1))	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:53 PM
L255	0	248 AND (((transmit$4 OR transmission) WITH (charge OR power) WITH (biuilding OR house)) OR ((alert$3	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:53 PM

		OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH ((minimum OR predetermined) WITH charg$3 WITH level)))					
L256	0	248 AND ((alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1) WITH ((minimum OR predetermined) WITH charg$3 WITH level))	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 08:54 PM
L257	1	("5686812" "7741816" "20090144622").pn. AND (alert$3 OR alarm$3 OR notify$3 OR notification$1 OR warning$1)	(US-PGPUB; USPAT)	OR	ON	ON	2023/03/31 11:04 PM
L258	3	("7443049" "7949435" "20080312782").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/25 08:50 PM
L259	2	("7443049" "7949435" "20080312782").pn. AND (mobile OR phone OR cell OR (cell ADJ phone))	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/25 08:53 PM
L260	59	((("AMBROZIAK") near3 ("Jeffrey")) OR (("FINCHAM") near3 ("Carson"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/07/26 12:27 AM
L261	0	260 NOT 244	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2023/07/26 12:28 AM
L262	125	(predetermined OR desired OR specific) WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification$1) WITH (mobile OR cellular OR (smart ADJ phone) OR pda)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:30 AM
L263	7	22 AND (predetermined OR desired OR specific) WITH charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification$1) WITH (mobile OR cellular OR (smart ADJ phone) OR pda)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:30 AM
L264	118	262 NOT 263	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:32 AM

L265	0	264 AND ((charger OR ccharging) WITH (wired OR connected OR interconnected) WITH building)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:33 AM
L266	0	264 AND ((charger OR charging) WITH (wired OR connected OR interconnected) WITH building)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:33 AM
L267	1496	((charger OR charging) WITH (wired OR connected OR interconnected) WITH building)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:33 AM
L268	38	(charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification$1)) AND ((charger OR charging) WITH (wired OR connected OR interconnected) WITH building)	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:34 AM
L269	16	(charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification$1)) AND ((charger OR charging) WITH (wired OR connected OR interconnected) WITH building) AND 22	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:34 AM
L270	14	mobile AND (charg$3 WITH level WITH (alert$3 OR alarm$3 OR notif$4 OR notification$1)) AND ((charger OR charging) WITH (wired OR connected OR interconnected) WITH building) AND 22	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:35 AM
L271	11	("20080007202"|"20080054845"|"20090139781"|"20090313174"|"20100228405"|"20110266996"|"6963186"|"20090063183"|"20100106631"|"6424158"|"7917179").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/26 12:37 AM
L272	440	("2514745" | "3356936" | "3562634" | "3593099" | "3607673" | "3676770" | "3729989" | "3753094"	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/07/26 12:45 AM

		| "3808522" | "3811089" | "3873911" | "3876931" | "3886443" | "3889248" | "3906329" | "3909708" | "3936744" | "3946299" | "3947757" | "3969667" | "3979664" | "3984762" | "3984768" | "3989544" | "4008619" | "4024953" | "4047091" | "4053824" | "4070624" | "4086531" | "4112351" | "4114083" | "4126874" | "4178546" | "4193025" | "4207611" | "4217645" | "4297639" | "4315204" | "4316185" | "4322685" | "4351405" | "4363407" | "4369407" | "4379989" | "4379990" | "4390828" | "4392101" | "4396880" | "4408157" | "4412169" | "4423378" | "4423379" | "4424491" | "4459548" | "4514694" | "4520353" | "4633418" | "4659977" | "4663580" | "4667143" | "4667279" | "4678998" | "4679000" | "4680528" | "4697134" | "4707795" | "4709202" | "4710861" | "4719428" | "4743855" | "4745349" | "4816768" | "4820966" | "4825170" | "4847547" | "4849700" | "4876495" | "4881038" | "4912416" | "4913116" | "4929931" | "4931738" | "4937528" | "4947124" | "4956597" | "4968941" | "4968942" | "5004979" | "5032825" | "5047722" | "5087881" | "5095223" | "5126675" | "5140269" | "5144218" | "5144248" | "5160881" | "5170124" | "5179335" | "5194799" | "5204611" | "5214370" | "5214385" | "5241275" | "5254952" | "5266880" | "5281919" | "5281920" | "5295078" | "5298797" | "5300874" | "5302902" | "5315287" | "5321626" | "5331268" | "5336993" | "5338515" | "5339018" | "5343380" | "5345163" | "5347163" | "5352968" | "5365160"					

		| "5365453" | "5381096" | "5412323" | "5426371" | "5426416" | "5432426" | "5434495" | "5435185" | "5442274" | "5449996" | "5449997" | "5451881" | "5455026" | "5457377" | "5469043" | "5485090" | "5488300" | "5519383" | "5528148" | "5537967" | "5546317" | "5548273" | "5550485" | "5561380" | "5562501" | "5572136" | "5574355" | "5583416" | "5585728" | "5589757" | "5592093" | "5596260" | "5598098" | "5602462" | "5606242" | "5621298" | "5633985" | "5637978" | "5642031" | "5650937" | "5652501" | "5653659" | "5656920" | "5675234" | "5677077" | "5699050" | "5701089" | "5705929" | "5710503" | "5717336" | "5717937" | "5739667" | "5747909" | "5754417" | "5757192" | "5760587" | "5773978" | "5789899" | "5793359" | "5808469" | "5818234" | "5821756" | "5825174" | "5831435" | "5862515" | "5872443" | "5895440" | "5914605" | "5929609" | "5939855" | "5939861" | "5945829" | "5969625" | "6002238" | "6008652" | "6009369" | "6031354" | "6037751" | "6037777" | "6051976" | "6072299" | "6072300" | "6081098" | "6091245" | "6094033" | "6104167" | "6114834" | "6137269" | "6140797" | "6150793" | "6161640" | "6163156" | "6172483" | "6172505" | "6181545" | "6222369" | "6225808" | "6249124" | "6250973" | "6254438" | "6259254" | "6262563" | "6294896" | "6294897" | "6304087" | "6310481" | "6313607" | "6313608" | "6316914" | "6323650" | "6329793" | "6331762" | "6332113" | "6346795" | "6347958").pn. OR				

		("6424158").urpn. AND (PGPB | USPT | USOC).dbnm.					
L273	25	270 NOT 271	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:45 AM
L274	14	270 NOT 271	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/26 12:45 AM
L275	8	269 NOT 270	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:46 AM
L276	157	268 NOT 269	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:47 AM
L277	0	272 AND 276	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/07/26 12:47 AM
L278	0	2008/0312782.pn.	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/08/10 02:11 PM
L279	1	"20080312782".pn.	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2023/08/10 02:11 PM
L280	8	("4347472" "4617506" "4800328" "5487002" "5623194" "5669470" "5686812" "5710502").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:11 PM
L281	49	("20030152088"|"20080039989"|"20080040223"|"20080162305"|"2008	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:13 PM

		0243331"|"2008027584 8"|"20090001927"|"200 90030712"|"200900892 54"|"20090130965"|"20 090139781"|"20090189 807"|"20090313034"|"2 0090313174"|"2011014 8356"|"4347472"|"5487 002"|"5623194"|"57105 02"|"5790976"|"589234 6"|"6421600"|"6586940" |"6618650"|"6727708"|" 7055340"|"7358701"|"7 671567"|"7683570"|"76 98078"|"7761203"|"777 8746"|"7782021"|"7827 120"|"7849944"|"79565 70"|"8198856"|"853116 2"|"20080312782"|"200 40010358"|"200900213 85"|"20110089887"|"46 17506"|"4800328"|"566 9470"|"7402978"|"7443 049"|"7880337"|"79494 35").PN.					
L282	1	280 NOT 281	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:14 PM
L283	11	("5790976" "5892346" "6421600" "6586940" "6618650" "6727708" "7055340" "7358701" "7402978" "7443049" "7671567").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:16 PM
L284	0	283 NOT 281	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:16 PM
L285	11	("7683570" "7698078" "7741816" "7761203" "1778746" "7782021" "1827120" "7849944" "7880337" "1949435" "7956570").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:17 PM
L286	4	285 NOT 281	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:17 PM
L287	11	("7683570" "7698078" "7741816" "7761203" "7778746" "7782021" "7827120" "7849944" "7880337" "7949435" "7956570").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:18 PM
L288	1	287 NOT 281	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:19 PM
L289	2	("8198856" "8531162").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:20 PM
L290	7	("20030152088" "20040010358"	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:20 PM

		"20080039989" "20080040223" "20080162305" "20080243331" "20080275848").pn.					
L291	0	(289 OR 290) NOT (281 OR 288)	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:21 PM
L292	11	("20080312782" "20090001927" "20090021385" "20090030712" "20090089254" "20090130965" "20090139781" "20090144622" "20090189807" "20090313034" "20090313174").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:22 PM
L293	1	292 NOT (281 OR 288)	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:22 PM
L294	1	293 AND "20090144622".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:24 PM
L295	0	293 AND "20090144622".pn. AND slid$4	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:24 PM
L296	0	293 AND "20090144622".pn. AND finger$1	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:24 PM
L297	1	293 AND "20090144622".pn. AND touch	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:24 PM
L298	1	293 AND "20090144622".pn. AND touch$3	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:24 PM
L299	1	293 AND "20090144622".pn. AND touch$3 AND charg$4	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:25 PM
L300	2	("20110089887" "20110148356").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:27 PM
L301	0	300 NOT (281 OR 28 OR 299)	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:27 PM
L302	1	"20230352963".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:29 PM
L303	160782	(B60L2240/72 Y02T10/72 Y02T90/167 B60L2260/54 B60L2250/16).cpc,cpci, cpca,cpoi.	(US-PGPUB; USPAT; FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 10:44 PM
L304	24500	(B60L2250/16).cpc,cpci, cpca,cpoi.	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP,	OR	ON	ON	2024/01/16 10:45 PM

			KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)				
L305	228	304 AND (slider OR slid$3) AND finger$1 AND charg$4	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 10:46 PM
L306	0	305 AND ((slider OR slid$3) WITH amount WITH charg$4)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 10:46 PM
L307	12	305 AND ((slider OR slid$3) WITH charg$4)	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 10:47 PM
L308	97	("20060089132"|"20110057613"|"20110239116"|"20110285345"|"20120181984"|"20120293122"|"20130041531"|"20130110632"|"20130308153"|"20140012448"|"20140021908"|"20140067191"|"20140074320"|"20140117946"|"20140239733"|"20140319232"|"20140347018"|"20140375247"|"20150091507"|"20150095115"|"20150095789"|"20150168309"|"20150249484"|"20150343916"|"20160013678"|"20160018943"|"20160031333"|"20160089997"|"20160099602"|"20160114687"|"20160150068"|"20160178740"|"20160236585"|"20160297314"|"20160336816"|"20160342297"|"20170008393"|"20170017393"|"20170041959"|"20170067753"|"20170166072"|"20170214275"|"20180141450"|"20180166907"|"20180241255"|"20180290553"|"201900746	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:49 PM

		38"|"9871387"|"20040165750"|"20070040911"|"20070273760"|"20080211914"|"20080239079"|"20150165978"|"20150260511"|"20170001527"|"20170008412"|"20170136631"|"20180056801"|"20180137614"|"7102665"|"10404089"|"10432039"|"10486549"|"10541547"|"10562397"|"10596918"|"20100161217"|"20100201315"|"20110175569"|"20110302078"|"20120052923"|"20120091959"|"20120095617"|"20120262002"|"20130281155"|"20130335015"|"20140055091"|"20140081481"|"20140333128"|"20150042271"|"20150054455"|"20150061576"|"20150061897"|"20150073642"|"20150224888"|"20150278038"|"20150286880"|"20180111492"|"20180215280"|"9180783"|"9626258"|"9800082"|"9819217"|"9867162"|"9882416"|"9931954").PN.					
L309	2	308 AND ((slider OR slid$3) WITH charg$4)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 10:49 PM
L310	1	309 AND ("20110175569").pn.	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 10:54 PM
L311	3	("20100013436"|"20110106329"|"20140125279"|"20140125279").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 10:56 PM
L312	1	311 AND ((slider OR slid$3) AND charg$4)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 10:58 PM

L313	13	(308 NOT 309) AND (slider OR slid$3) AND charg$4	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:05 PM
L314	1	313 AND "20150095115".pn.	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:11 PM
L315	1	313 AND "20110302078" .pn.	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:23 PM
L316	181	("20060005736"|"20090222143"|"20030200025"|"20030230443"|"20040035617"|"20040069549"|"20040070365"|"20040267617"|"20050154508"|"20050178632"|"20050200463"|"20050274556"|"20060061322"|"20060226703"|"20070052386"|"20070284158"|"20080007202"|"20080053716"|"20080067974"|"20080150490"|"20080179889"|"20080203973"|"20080218122"|"20080297109"|"20090057041"|"20090058371"|"20090079384"|"20090102433"|"20090121659"|"20090140698"|"20090140700"|"20090143929"|"20090144150"|"20090149290"|"20090167254"|"20090224724"|"20090251300"|"20090302801"|"20090313098"|"20090313103"|"20090313104"|"20100006356"|"20100017249"|"20100018785"|"20100019723"|"20100019734"|"20100026243"|"20100049396"|"20100049610"|"20100049639"|"20100049737"|"20100072953"|"2010008	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 11:24 PM

		2277"|"20100097036"|" 20100134067"|"201001 45535"|"20100156355"| "20100207588"|"20100 211643"|"20100235006 "|"20100241299"|"2010 0268411"|"2010027117 2"|"20100271192"|"201 00274570"|"201002746 56"|"20100277121"|"20 100283426"|"20100283 432"|"20100292855"|"2 0100301810"|"2010030 8769"|"20100315197"|" 20100320018"|"201003 20966"|"20110013322"| "3979650"|"4024448"|"4 258304"|"4308492"|"43 45197"|"4347472"|"449 6896"|"4525662"|"4542 462"|"4588939"|"50498 02"|"5150034"|"515732 1"|"5264776"|"5311973" |"5319299"|"5323737"|" 5352982"|"5412323"|"5 429524"|"5433623"|"54 55466"|"5458496"|"546 1298"|"5463303"|"5481 176"|"5521443"|"55236 66"|"5539296"|"554820 0"|"5556284"|"5563491" |"5577920"|"5581171"|" 5583418"|"5596258"|"5 596261"|"5614808"|"56 17003"|"5623194"|"562 5272"|"5627448"|"5629 606"|"5635817"|"56569 16"|"5661391"|"575113 5"|"5757595"|"5816643" |"5820395"|"5847537"|" 5909100"|"5929599"|"5 936381"|"5952813"|"59 82139"|"5984706"|"606 0861"|"6095270"|"6114 834"|"6123569"|"61278 00"|"6137262"|"614747 3"|"6150794"|"6281660" |"6300742"|"6310464"|" 6334354"|"6380701"|"6 421600"|"6448740"|"66 31775"|"6650086"|"668 4156"|"6686724"|"6710 575"|"6747437"|"67948 47"|"6805090"|"683378 4"|"6850898"|"6876174" |"6879889"|"6917180"|" 6924621"|"6946816"|"7 091839"|"7096984"|"71					

		93394"|"7201384"|"7402978"|"7412309"|"7520355"|"7605561"|"7622897"|"7629772"|"7629773"|"7671567"|"7679336"|"7688024"|"7692404"|"7768229"|"7804274"|"RE37610"|"20090313103"|"20060005736"|"20090222143").PN.					
L317	20	316 AND ((slider OR slid$3) WITH charg$4)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:24 PM
L318	1	317 AND "20090143929".pn.	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:30 PM
L319	1	317 AND "20090143929".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 11:31 PM
L320	0	319 AND 281	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 11:32 PM
L321	6	("4308493"|"5872453"|"5939864"|"6011380"|"6188202"|"6904342").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 11:39 PM
L322	0	321 AND slid$4 AND charg$3	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/16 11:39 PM
L323	554814	22 OR 303	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:43 PM
L324	17803	323 AND (slider OR slid$3) AND charg$4	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:44 PM
L325	252	307 OR 308 OR 309 OR 310 OR 311 OR 312 OR 313 OR 314 OR 321	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:45 PM

L326	14	325 AND ((slider OR slid$3) WITH charg$4)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/16 11:47 PM
L327	61	((("AMBROZIAK") near3 ("Jeffrey")) OR (("FINCHAM") near3 ("Carson"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2024/01/17 12:02 AM
L328	13	327 AND ((slider OR slid$3) WITH charg$4)	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/17 12:02 AM
L329	1	"20230352963".pn.	(US-PGPUB; USPAT; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/17 11:11 PM
L330	1	"20090313174".pn.	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/17 11:51 PM
L331	15	("5790976" "20090139781" 2008/0039989 "20090189807" "20090313174" "20090139781" "5669470" "20090130965" "7402978").pn.	(US-PGPUB; USPAT; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; IBM_TDB)	OR	ON	ON	2024/01/17 11:54 PM
L332	7	("5790976" "20090139781" 2008/0039989 "20090189807" "20090313174" "20090139781" "5669470" "20090130965" "7402978").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/17 11:55 PM
L333	1	("20080039989").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/18 12:00 AM
L334	1	"20160236585".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/18 12:17 AM
L335	1	"20150095115".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/18

							12:22 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	18340781
Filing Date	2023-06-23
First Named Inventor	Jeffrey R. Ambroziak
Art Unit	3649
Examiner Name	TBD
Attorney Docket Number	CF01-001-02-07

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	4347472		1982-08-31	LEMELSON JEROME H	
	2	4617506		1986-10-14	BOGIE JON R	
	3	4800328		1989-01-24	BOLGER JOHN G	
	4	5487002		1996-01-23	DILLER ROBERT W	
	5	5623194		1997-04-22	BOLL WOLF	
	6	5669470		1997-09-23	ROSS HOWARD R	
	7	5686812		1997-11-11	HOTTA YOSHIHIKO	
	8	5710502		1998-01-20	POUMEY MICHEL	

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	Attorney Docket Number	CF01-001-02-07

	9	5790976		1998-08-04	BOLL WOLF	
	10	5892346		1999-04-06	MOROTO SHUZO	
	11	6421600		2002-07-16	ROSS HOWARD R	
	12	6586940		2003-07-01	ASAKURA KAORU	
	13	6618650		2003-09-09	NAKAI TOMOAKI	
	14	6727708		2004-04-27	DOUGHERTY THOMAS J	
	15	7055340		2006-06-06	UMEBAYASHI MAKOTO	
	16	7358701		2008-04-15	FIELD ROBERT B	
	17	7402978		2008-07-22	PRYOR BRYAN K	
	18	7443049		2008-10-28	JONES JAMES L	
	19	7671567		2010-03-02	EBERHARD MARTIN FOREST	

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	20	7683570		2010-03-23	KRAUER JEAN-PIERRE	
	21	7698078		2010-04-13	KELTY KURT	
	22	7741816		2010-06-22	KELTY KURT RUSSELL	
	23	7761203		2010-07-20	YAMADA KAZUNAO	
	24	7778746		2010-08-17	MCLEOD PAUL W	
	25	7782021		2010-08-24	KELTY KURT RUSSELL	
	26	7827120		2010-11-02	EVANS SCOTT A	
	27	7849944		2010-12-14	DEVAULT ROBERT C	
	28	7880337		2011-02-01	FARKAS LASZLO	
	29	7949435		2011-05-24	POLLACK SETH B	
	30	7956570		2011-06-07	LOWENTHAL RICHARD	

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	31	8198856		2012-06-12	KOIDE KEISUKE	
	32	8531162		2013-09-10	HAFNER JAMES LEE	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20030152088		2003-08-14	KOMINAMI YUKIO	
	2	20040010358		2004-01-15	OESTERLING CHRISTOPHER L	
	3	20080039989		2008-02-14	POLLACK SETH B	
	4	20080040223		2008-02-14	BRIDGES SETH W	
	5	20080162305		2008-07-03	ROUSSO ARMAND	
	6	20080243331		2008-10-02	KATO KAZUYA	
	7	20080275848		2008-11-06	ALLEN MARK G	

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	Attorney Docket Number	CF01-001-02-07

	8	20080312782		2008-12-18	BERDICHEVSKY GENE	
	9	20090001927		2009-01-01	STAMOS EUTHEMIOS NICHOLAS	
	10	20090021385		2009-01-22	KELTY KURT	
	11	20090030712		2009-01-29	BOGOLEA BRADLEY D	
	12	20090089254		2009-04-02	VON KAENEL TIM A	
	13	20090130965		2009-05-21	GALVEZ-RAMOS ANTONIO MARTIN	
	14	20090139781		2009-06-04	STRAUBEL JEFFREY BRIAN	
	15	20090144622		2009-06-04	EVANS DAVID K	
	16	20090189807		2009-07-30	SCALISI JOSEPH F	
	17	20090313034		2009-12-17	FERRO ERICA HAEFNER	
	18	20090313174		2009-12-17	HAFNER JAMES LEE	

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	19	20110089887		2011-04-21	WARD THOMAS A	
	20	20110148356		2011-06-23	LOWENTHAL RICHARD	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2003294463A	JP		2003-10-15	NISSAN MOTOR		☒
	2	2006112932A	JP		2006-04-27	FUJI HEAVY IND LTD		☐
	3	2006298262A	JP		2006-11-02	TOYOTA MOTOR CORP		☒
	4	H1055496A	JP		1998-02-24	HITACHI LTD		☒
	5	H10170293A	JP		1998-06-26	NISSAN MOTOR		☒
	6	2004109889	WO		2004-12-16	FUJITSU LTD		☒
	7	2008059846A1	WO		2008-05-22	MATSUSHITA ELECTRIC IND CO LTD		☒

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Notice of Allowance for Application No. 117/012,325 (Attorney Docket No. CF01-001-02-02) dated March 12, 2021; 12 pps.	☐
	2	Notice of Allowance or Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated September 21, 2020; 16 pps.	☐
	3	Defendant Disclosure of Preliminary Proposed Claim Term Constructions (Charge Fusion Technologies, LLC v. Tesla, Inc., W.D.TX, 6:21-cv-01078-ADA) of U.S. Patents 9,853,488 / 10,819,135 / 10,998,753 for Application Nos. 12/502,041 / 15/848,017 / 17/012,325 (Attorney Docket Nos. CF01-001-02 / CF01-001-02-01 / CF01-001-02-02) dated April 29, 2022; 9 pps.	☐
	4	Defendant Motion to Dismiss (Charge Fusion Technologies, LLC v. Tesla, Inc., W.D.TX, 6:21-cv-01078-ADA) of U.S. Patents 9,853,488 / 10,819,135 / 10,998,753 for Application Nos. 12/502,041 / 15/848,017 / 17/012,325 (Attorney Docket Nos. CF01-001-02 / CF01-001-02-01 / CF01-001-02-02) dated January 7, 2022; 18 pps.	☐
	5	Defendant Preliminary Invaldity Contentions (Charge Fusion Technologies, LLC v. Tesla, Inc., W.D.TX, 6:21-cv-01078-ADA) of U.S. Patents 9,853,488 / 10,819,135 / 10,998,753 for Application Nos. 12/502,041 / 15/848,017 / 17/012,325 (Attorney Docket Nos. CF01-001-02 / CF01-001-02-01 / CF01-001-02-02) dated April 1, 2022; 51 pps.	☐
	6	Final Office Action for Application No. 117/012,325 (Attorney Docket No. CF01-001-02-02) dated February 12, 2021; 16 pps.	☐
	7	Final Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 3, 2014; 21 pps.	☐
	8	Final Office Action for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated March 29, 2012; 9 pps.	☐
	9	First Office Action for Application No. 117/012,325 (Attorney Docket No. CF01-001-02-02) dated December 2, 2020; 2 pps.	☐

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	First Named Inventor	Jeffrey R. Ambroziak
	Art Unit	3649
	Examiner Name	TBD
	Attorney Docket Number	CF01-001-02-07

	10	Inter Partes Review Decision (DENIED) of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated August 24, 2022; IPR PR2022-00519; 12 pps.	☐
	11	Inter Partes Review Notice of filing date accorded, Inter Partes Review of U.S. Patent 10,819,135 for Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated November 17, 2022; IPR2023-00063; 5 pps.	☐
	12	Inter Partes Review Notice of filing date accorded, Inter Partes Review of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated August 4, 2022; IPR 2022-01217; 5 pps.	☐
	13	Inter Partes Review Notice of filing date accorded, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated March 17, 2022; IPR PR2022-00519; 5 pps.	☐
	14	Inter Partes Review Notice of filing date accorded, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated November 17, 2022; IPR2023-00062; 5 pps.	☐
	15	Inter Partes Review Petition of U.S. Patent 10,819,135 for Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated October 21, 2022; IPR2023-00063; 232 pps.	☐
	16	Inter Partes Review Petition of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated July 22, 2022; IPR 2022-01217; 594 pps.	☐
	17	Inter Partes Review Petition of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 25, 2022; IPR PR2022-00519; 1719 pps.	☐
	18	Inter Partes Review Petition of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated October 21, 2022; IPR2023-00062; 333 pps.	☐
	19	Inter Partes Review Preliminary Patent Owner's Response of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated June 17, 2022; IPR PR2022-00519; 1690 pps.	☐
	20	Inter Partes Review Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated November 4, 2022; IPR 2022-01217; 121 pps.	☐

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	First Named Inventor	Jeffrey R. Ambroziak
	Art Unit	3649
	Examiner Name	TBD
	Attorney Docket Number	CF01-001-02-07

	21	Inter Partes Review: Decision Granting Institution of Inter Partes Review for U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated February 01, 2023; IPR 2022-01217; 27 pps.	☐
	22	Inter Partes Review: Patent Owner's Objections to Evidence for U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated February 09, 2023; IPR 2022-01217; 7 pps.	☐
	23	Inter Partes Review: Patent Owner's Sur-Reply, Inter Partes Review of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated December 16, 2022; IPR 2022-01217; 12 pps.	☐
	24	Inter Partes Review: Petitioner's Reply to Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 10,998,753 for Application No. 17/012,325 (Attorney Docket No. CF01-001-02-02) dated December 09, 2022; IPR 2022-01217; 15 pps.	☐
	25	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 10,819,135 for Application No. 15/848,017 (Attorney Docket No. CF01-001-02-01) dated February 17, 2023; IPR2023-00063; 439 pps.	☐
	26	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 01).	☐
	27	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 02a).	☐
	28	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 02b).	☐
	29	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 02c).	☐
	30	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 02d).	☐
	31	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 03a).	☐

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	Attorney Docket Number	CF01-001-02-07

	32	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 03b).	☐
	33	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 03c).	☐
	34	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 03d).	☐
	35	Inter Partes Review: Preliminary Patent Owner's Response, Inter Partes Review of U.S. Patent 9,853,488 for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated February 17, 2023; IPR2023-00062; 3,780 pps (Part 04).	☐
	36	Litigation Report (Charge Fusion Technologies, LLC v. Tesla, Inc., W.D.TX, 6:21-cv-01078-ADA) of U.S. Patents 9,853,488 / 10,819,135 / 10,998,753 for Application Nos. 12/502,041 / 15/848,017 / 17/012,325 (Attorney Docket Nos. CF01-001-02 / CF01-001-02-01 / CF01-001-02-02) dated May 12, 2022; 1 pp.	☐
	37	Notice of Allowance dated 01/05/2023 for US App. No. 17829408 (Attorney Docket No. CF01-001-02-05) (pages 1-13)	☐
	38	Notice of Allowance dated 09/14/2022 for US App. No. 17829408(Attorney Docket No. CF01-001-02-05) (pages1-15)	☐
	39	Notice of Allowance dated 09/28/2022 for US App. No. 17829412 (pages 1-17)	☐
	40	Notice of Allowance dated 12/18/2022 for US App. No. 17829412 (Attorney Docket No. CF01-001-02-06) (pages 1-13)	☐
	41	Notice of Allowance dated 12/19/2022 for US App. No. 17829408 (Attorney Docket No. CF01-001-02-05) (pages 1-13)	☐
	42	Notice of Allowance for Application No. 12/502,041 (Attorney Docket No. CF01-001-02) dated October 30, 2017; 7 pps	☐

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	Examiner Name	TBD
	Attorney Docket Number	CF01-001-02-07

	43	Office Action (Final Rejection) dated 04/06/2023 for US App. No. 17826229 (pages 1-20)	☐
	44	Office Action (Non-Final Rejection) dated 07/31/2023 for US App. No. 17826229 (pages 1-17)	☐
	45	Office Action (Non-Final Rejection) dated 09/21/2022 for US App. No. 17826229 (pages 1-17)	☐
	46	Office Action (Non-Final Rejection) dated 09/26/2022 for US App. No. 17306776 (pages 1-20)	☐
	47	Office Action (Notice of Allowance and Fees Due (PTOL-85)) dated 03/09/2023 for US App. No. 17306776 (pages 1-15)	☐
	48	Office Action dated 09/21/2022 for US App. No. 17826229 (pages 1-18)	☐
	49	Office Action dated August 3, 2022 for US App. No. 17/826,229 (pages 1-4)	☐
	50	Office Action dated August 4, 2022 for US App. No. 17/829,408 (pages 1-4)	☐

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EXAMINER SIGNATURE

Examiner Signature	/IGOR N BORISSOV/ (01/16/2024)	Date Considered	01/16/2024

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Receipt date: 08/04/2023

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Art Unit	3649
Examiner Name	TBD
Attorney Docket Number	CF01-001-02-07

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Carson C.K. Fincham, Reg. No. 54,096/	Date (YYYY-MM-DD)	2023-08-04
Name/Print	Carson C.K. Fincham	Registration Number	54096

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PART B – FEE(S) TRANSMITTAL

Complete and send this form, together with the applicable fee(s), by mail or fax, or via EFS-Web or Patent Center.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By fax, send to: (571) 273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

RowanTree Law Group, PLLC
90 Grove Street - Suite 205
Ridgefield, CT 06877

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or Patent Center, on the date below.

Limor N. Bredmehl	(Typed or printed name)
/Limor N. Bredmehl/	(Signature)
4/17/2024	(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
18/340,781	06/23/2023	Jeffrey R. Ambroziak	CF01-001-02-07	8229

TITLE OF INVENTION:

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	04/24/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
BORISSOV, IGOR N	3649	705-007360

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363)

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-09 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. RowanTree Law Group PLLC
2. Carson C.K. Fincham
3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Charge Fusion Technologies, LLC

(B) RESIDENCE: (CITY and STATE or COUNTRY): Ridgefield, CT

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees Submitted: ☒ Issue Fee ☒ Publication Fee (if required)

4b. Method of Payment (*Please first reapply any previously paid fee shown above*):

☒ Electronic Payment via Patent Center or EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-5363

5. Change of Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29. NOTE: Absent a valid Certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27. NOTE: If the application was previously under micro entity status, checking this box will be taken as a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status. NOTE: Checking this box will be taken as a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Carson C.K. Fincham, Reg.#54096/ Date April 17, 2024

Typed or printed name Carson C.K. Fincham Registration No. 54096

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/340,781	04/17/2024 11:21:22 AM Z ET	CF01-001-02-07

Title of Invention

SYSTEMS AND METHODS FOR GRAPHICAL USER INTERFACE (GUI)-BASED CHARGING OF ELECTRIC VEHICLES

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	8229	FILED BY	Limor Bredmehl
PATENT CENTER #	65126634	AUTHORIZED BY	Carson Fincham
CUSTOMER #	89411	FILING DATE	06/23/2023
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Mr. Jeffrey R. Ambroziak

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 6195	E20244GB22199898	Limor Bredmehl

PRE-AUTHORIZED ACCOUNT	PRE-AUTHORIZED CATEGORY
505363	37 CFR 1.16 (National application filing, search, and examination fees); 37 CFR 1.17 (Patent application and reexamination processing fees); 37 CFR 1.19 (Document supply fees); 37 CFR 1.20 (Post issuance fees); 37 CFR 1.21 (Miscellaneous fees and charges)

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2501	UTILITY ISSUE FEE	480.00	1	480.00
			TOTAL AMOUNT:	$480.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d)

and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES
PATENT AND TRADEMARK OFFICE

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Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/340,781	**04/17/2024 11:21:22 AM Z ET**	**CF01-001-02-07**

Title of Invention

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Application Information

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CONFIRMATION #	8229	FILED BY	Limor Bredmehl
PATENT CENTER #	65126634	FILING DATE	06/23/2023
CUSTOMER #	89411	FIRST NAMED INVENTOR	Mr. Jeffrey R. Ambroziak
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Carson Fincham

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
CF01-001-02-07_IFEE_2024-04-17a.pdf	1	Issue Fee Payment (PTO-85B)	218 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
CF01-001-02-07_IFEE_2024-04-17a.pdf	65C7A6FF65760C9C0D54EA9EFA5FAD5E4DF488D0DD7501C19D9F94D73C401B84E37E99A5FDED9FA8F3E6A6895D7D0DD8CA6BDCEA5960338F18DE05BD0FF7A446

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/340,781	05/21/2024	11990788	CF01-001-02-07	8229

89411 7590 05/01/2024

RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Center (https://patentcenter.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Mr.Jeffrey R. Ambroziak, Guilford, CT;
Mr.Carson C.K. Fincham, Ridgefield, CT;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

Charge Fusion Technologies, LLC, Ridgefield, CT;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/340,781	06/23/2023	Jeffrey R. Ambroziak	CF01-001-02-07	8229

89411 7590 05/21/2024

RowanTree Law Group, PLLC
90 Grove Street
Suite 205
Ridgefield, CT 06877

EXAMINER
BORISSOV, IGOR N

ART UNIT	PAPER NUMBER
3649	

NOTIFICATION DATE	DELIVERY MODE
05/21/2024	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ePAIR@rowantreelaw.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
18/340,781	21-May-2024	11990788

RowanTree Law Group, PLLC
90 Grove Street
Ridgefield, CT 06877

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants